Cosmetic and/or pharmaceutical preparations comprising polysiloxane-containing addition polymers and use thereof

The present invention relates to cosmetic and/or pharmaceutical preparations comprising water-soluble or water-dispersible polysiloxane-containing polymers and further polymers and/or UV light protection filters. It also relates to the use of these preparations, and to that of the polysiloxane-containing addition polymers.

Polymers with film-forming properties are used for cosmetic and/or pharmaceutical preparations and are suitable, in particular, as additives for hair and skin cosmetics.

In cosmetic preparations for the skin, polymers can display particular activity. The polymers can, inter alia, contribute to the moisture retention and conditioning of the skin and to an improvement in the feel of the skin. The skin becomes smoother and more supple.

In cosmetic preparations for the hair, polymers are used for setting, shaping and improving the structure of hair. They increase the combatibility and improve the feel of the hairs. These hair-treatment compositions generally comprise a solution of the film former in an alcohol or a mixture of alcohol and water.

A requirement of hair-treatment compositions is that they inter alia impart shine, flexibility and a natural, pleasant feel to the hair.

It is known to use vinyllactam homo- and copolymers or carboxylate-containing polymers. The desired profile of properties, such as strong setting at high atmospheric humidity, elasticity, ability to be washed out of the hair and compatibility with the other formulation components, is achieved by copolymerization of a combination of hydrophobic, elastifying and carboxyl-containing monomers.

The feel of hairstyles set using these polymers, however, is unpleasantly harsh and unnatural. Although the addition of softeners improves the feel of such hairstyles, it also reduces the setting action.

Use is frequently made of polysiloxanes, although these are incompatible with polar polymers and often require further additives in order that they can be formulated at all. Separations can lead to problems both during storage of the formulation and during use.

In order to prevent separations, there has therefore been no lack of attempts to bind polysiloxane groups covalently to the polymer. EP-A 408 311 describes graft copolymers with a carbon main chain to which polydimethylsiloxane side chains are bonded. Only polymers which are prepared using unsaturated monomers which carry a polysiloxane chain are described. Graft copolymers with a carbon main chain to which polydimethylsiloxane side chains are bonded are not described.

EP-A 670 342 describes the use of alkoxylated silicones in hair care compositions. The use of addition polymers of unsaturated compounds in hair care compositions is not disclosed. Although the use of alkoxylated silicones as additive to commercially available hair-setting polymers does improve the feel thereof, it also leads to reduced setting action.

European patents EP-A 412 704 and EP-A 412 707 describe polysiloxane groups in the form of macromonomers having molar masses of from 1000 to 50,000, which are polymerized with customary hydrophobic and hydrophilic monomers. The synthesis of these monomers is extraordinarily complex. Because of their high molecular weight, it is virtually impossible to separate out unreacted monomers and unreactive impurities thereof from the polymers. These represent a toxicological and allergenic risk. Moreover, the copolymers obtained, in order to achieve a good action, must often be formulated only in combination with further polymers, carriers and further auxiliaries, as the abovementioned patents teach.

DE 42 40 108 describes polysiloxane-containing binders which are suitable as soil-repellent coatings, in particular as antigraffiti coatings. These binders are, however, varnish-like and are not suitable for cosmetic purposes.

WO 99/04750 describes polymers obtainable by free-radical polymerization of ethylenically unsaturated monomers in the presence of polyalkylene oxide-containing silicone derivatives.

The invention provides for the use of an addition polymer obtainable by free-radical polymerization of a monomer mixture of

(a) ethylenically unsaturated monomers and

(b) polyalkylene oxide-containing silicone derivatives

in pharmaceutical preparations.

Solid pharmaceutical presentations such as tablets, capsules, pellets, granules, crystals etc. are coated, i.e. provided with a film coating, for a very wide variety of reasons. It is possible in this way, for example, to mask an unpleasant odor or taste, and to improve swallowability. The stability of the active ingredient can be increased by the coating, since less water vapor and oxygen passes to the inside of the tablets. The presentations have a better appearance and can be distinguished better by incorporating dyes. Moreover, the rate of release of the active ingredient, in particular, can be adjusted by the film coating.

A distinction is generally made between instant release forms and slow release forms.

In the case of instant release forms, the disintegration of the tablet and the release of the active ingredient from the presentation should, where possible, be uneffected by the coating, for which reason the film coating must dissolve rapidly in gastric fluid. In addition, it must have good film properties. The tensile strength and the elongation at break should be high so that the film coating withstands mechanical effects like those which arise during pharmaceutical processing - especially packaging - and also during transportation or storage.

A frequently used product for the coating of instant release tablets is hydroxypropylmethylcellulose (HPMC). Hydroxypropylmethylcellulose exhibits a steep rise in viscosity with increasing concentration in aqueous solution. Similar behavior is also exhibited by hydroxypropylcellulose (HPC).

Since the film former solution must be finely atomized during the coating of tablets, and the droplets which are formed must thoroughly wet the surface of the tablets and must also spread well, the viscosity must not exceed a certain limit (between 150 and 250 mPas) which depends on the type of spray nozzle and the equipment. It is therefore possible in the case of HPMC to use only relatively low film former concentrations.

The recommendation given in the literature for the concentration of Pharmacoat® 606 (Shin-etsu) is 5 to 7% by weight (Pharmaceutical Coating Technology, edited by Graham Cole, Taylor and Francis Ltd. 1995 and manufacturer's technical data sheets). These low spray concentrations result in relatively long processing times and thus high costs.

Moreover, hydroxypropylmethylcellulose has other disadvantages, inter alia in the wetting behavior, in the adhesiveness on the tablet surface, in the pigment binding capacity, in the mechanical properties of the films, in the hygroscopicity, and in the permeability for water vapor and oxygen, in the rate of dissolution and in the difference in disintegration time between film-coated tablets and core.

The low elasticity of the films made of hydroxypropylmethylcellulose frequently leads to the film-coated tablets splitting open during storage in damp conditions, as a consequence of the swelling of the core. Even the use of plasticizers results in negligible improvements regarding this problem. On the contrary, it may lead to tacky films and, as a result of migration, to changes in the tablet properties.

Oral drug forms which release the medicinal substance over an extended period with the aim of prolonging the effect of the active component (generally slow release drug forms) are becoming increasingly important. They are advantageously associated with improved patient compliance as a result of having to be taken less frequently, a reduction in side effects as a result of the avoidance of plasma peaks, more uniform blood levels of the medicinal substance, and the avoidance of local irritations. In addition to the formulation of medicinal substance-containing cores which have been coated with a water-insoluble, but semipermeable or pore-containing film through which the medicinal substance diffuses, release can be controlled and prolonged by embedding the medicinal substance into matrices. Furthermore, the use of ion exchanger resins and therapeutic systems (e.g. OROS) is possible.

Embedding of the medicinal substance into hydrocolloid matrices in particular offers the advantages of a simple and low-cost manufacture and a high degree of drug safety since dose dumping effects cannot arise. The auxiliaries usually used for this purpose, such as hydroxypropylmethylcellulose (HPMC), hydroxypropylcellulose, alginic acid or alginates, and xanthan have disadvantages on use. Those which may be mentioned are: inadequate flow properties which impede direct tableting, a

dependence of the release of medicinal substance on the osmolarity (salt content) and on the pH of the release medium. This applies equally to HPMC and to hydroxypropylcellulose, xanthan and alginates. The use of xanthan also leads to tablets of low hardness, and the direct tableting of alginates results in compacts with only slight release-slowing properties (max. 8 h). The natural swelling substances (e.g. alginates) show overall a wide variability between batches.

Binders are used in pharmaceutical presentations in order to increase the processability and the mechanical strength. They are usually used in tablets, granules and pellets and lead to improved flowability, higher breaking strength and lower friability.

The binders currently used, such as maltodextrin or polyvinylpyrrolidones, often result in unsatisfactory breaking strengths and friabilities. Other binders, such as starch paste and hydroxypropylmethylcellulose (HPMC), can be employed only in low concentrations because of their high viscosity.

In addition, film-forming auxiliaries are used in solutions and sprays which are applied to the skin or mucous membrane or else introduced systemically into the body. Examples thereof are preparations for wound treatment and spray-on dressings, but also preparations for application to intact skin or mucous membrane. Here, the skin is protected by a film, and the active ingredients can penetrate into or through the skin.

In the case of transdermal therapeutic systems and in the case of wound plasters, just as in the case of the abovementioned presentations, high flexibility is required, but the products available at present do not have this. The use of possible plasticizers for achieving the necessary flexibility is undesirable for toxicological and pharmacological reasons.

It is an object of the present invention to provide water-soluble or water-dispersible polymers as coating agents, binders and/or film formers in pharmaceutical preparations which do not have the disadvantages given above.

Surprisingly, we have found that the addition polymers according to the invention are suitable for use in pharmaceutical preparations.

They are suitable in particular as coating agents, binders and/or film formers in pharmaceutical preparations. They are suitable in particular in oral pharmaceutical preparations as matrix for the release of active ingredients.

The polymers according to the invention can be used in a large number of pharmaceutical preparations.

For example, it is possible to mention, as coated preparations, film-coated tablets, film-coated microtablets, sugar-coated tablets, coated pastilles, capsules, crystals, granules or pellets.

The binder-containing preparations are, for example, tablets, microtablets, cores, granules or pellets.

Furthermore, the polymers according to the invention can be used for the preparation of solutions and sprays which, applied to skin or mucous membrane, form a film. As a result of the enormous expandability and adhesiveness, the films adhere for a long period to the skin or mucous membrane. The application frequency can thus be reduced, and the comfort of wearing is increased. Examples thereof are spray-on dressings for wounds, disinfectant sprays, solutions with mycostatics, mouth sprays or solutions with antibiotics etc. Because of the flexibility, the use for transdermal therapeutic systems is also advantageous.

The polymers used according to the invention wet lipophilic surfaces readily and have excellent protective colloid properties. Incorporated into suspensions and emulsions, they attach themselves to the particles of the dispersed phase and stabilize it. They can therefore be used as wetting auxiliaries and stabilizers in disperse systems.

By interacting with medicinal substances which are sparingly soluble in water, they improve the solubility and rate of dissolution of said substances, as a result of which absorbability and bioavailability of the medicinal substances are improved. This advantageous effect is evident, for example, in presentations in which the active ingredient is not in dissolved form, such as, for example, tablets, granules, suspensions etc.

The polymers used according to the invention can, where appropriate also in combination with other auxiliaries, be processed together with active ingredients to give polymer/active ingredient melts which are either extruded or calendered to give medicinal substances or, after extrusion, are comminuted to give

granules or powders and only then processed to give drug forms, for example compressed to give tablets. Here, the polymers according to the invention bring the properties already listed above into the preparations.

In various pharmaceutical preparations, the polymers according to the invention satisfy the following functions in an excellent manner:

Dispersion auxiliary, suspending auxiliary, wetting agent, solubilizer for sparingly soluble medicinal substances, emulsifier, crystallization inhibitor, anticaking auxiliary, protective colloid, bioadhesive to prolong and intensify contact with the mucous membrane, spreading auxiliary, viscosity regulator, auxiliary for preparing solid solutions with medicinal substances, auxiliary for adjusting the release of active ingredient in slow release formulations.

The polymers according to the invention which are insoluble or only slightly soluble, but dispersible, in water can also be used as slow release polymers and as adhesives for active ingredient plasters.

When used to prepare suppositories and pessaries, the polymers on the one hand ensure flexibility of the presentation, and on the other promote the disintegration and dissolution of active ingredient, and they coat the mucous membrane with an active ingredient-containing film which enhances absorption.

Tablets swell to varying degrees depending on the auxiliaries and active ingredients used, the storage time and the storage conditions, such as temperature and humidity. A rigid film coating suffers cracks during swelling of the core. For this reason, the elasticity of film formers is an important parameter.

The polymers can be applied in pure form or else together with conventional auxiliaries to the active ingredient-containing core. Examples of customary auxiliaries are colored pigments for imparting color, white pigments, such as titanium dioxide, for increasing coverage, talc and silicon dioxide as nonstick agents, polyethylene glycols, glycerol, propylene glycol, triacetin, triethyl citrate as plasticizers and various surface-active substances, such as sodium lauryl sulfate, Polysorbate 80, Pluronics and Cremophores, to improve the wetting behavior. The substances given by way of example do not represent a limitation.

It is possible to use all known additives suitable for film coatings which are soluble in gastric fluid.

Coating processes which can be used are the customary processes, such as coating in a fluidized bed or in a horizontal drum coater, the dip-coating process and the pan-coating process. In addition to the use on tablets, the polymers according to the invention can also be used for the coating of other pharmaceutical preparations, such as granules, pellets, crystals or capsules. The novel coating agents are applied in a conventional manner in a thickness of from 5 to 200 µm, preferably 10 to 100 µm.

In the case of use as binders, a distinction is made between wet and dry binders depending on the processing method. The latter are used inter alia for direct tableting and for dry granulation and compaction. Here, the binder is mixed with the active ingredient and optionally further auxiliaries and then directly tableted, or granulated and compacted.

In contrast thereto, in wet granulation the active ingredient/auxiliary mixture is moistened with a solution of the binder in water or an organic solvent, and the moist mass is passed through a sieve and then dried. Moistening and drying may also take place in parallel, such as, for example, in fluidized-bed granulation.

For optimal processing, the binder should have a low viscosity in solution since viscous solutions lead to inhomogeneous granules.

A binder should lead to uniform, hard, abrasion-resistant granules or tablets. In the case of tablets in particular, the breaking strength is of particular importance since many active ingredients are difficult to compress and thus give tablets with insufficient mechanical stability.

Furthermore, the disintegration of the medicinal presentations, and the rate of release of the active ingredients should be notably adversely affected by the binder.

The most common binders are, for example, polyvinylpyrrolidone, vinyl acetate/vinylpyrrolidone copolymers, gelatine, starch paste, maltodextrins, hydroxyalkylated or carboxyalkylated cellulose derivatives, such as hydroxypropylmethylcellulose, methylcellulose, sodium carboxymethylcellulose, and natural gum types, such as, for example, gum arabic, pectin or alginate.

Many of these binders have a high viscosity in solution and are difficult to process. As a result of the high viscosity, the powder particles to be granulated are poorly and nonuniformly wetted, resulting in a granule strength which is too low and in a particle size distribution which is unfavorable.

In addition, many binders are hygroscopic and swell on absorption of water. This may drastically alter the granule and tablet properties.

It has now been found, surprisingly, that the polymers according to the invention have excellent effects as binders and, moreover, have a negligible effect on disintegration in concentration ranges from 0.5 to 20% by weight, preferably 1 to 10% by weight, of the total amount of the formulation. In addition, because of the good wetting behavior, it is possible to improve the release of sparingly soluble active ingredients.

When the polymers are used as binders, the resulting granules and tablets are exceptionally mechanically stable and are also stable over long storage periods.

It is a further object of the present invention to provide new types of preparations which permit, in particular, improved hair care and skin care.

Of particular interest was also the provision of preparations which have improved film formations. This was of interest both for pharmaceutical preparations and also for cosmetic preparations, such as, in particular, UV light protection agents and decorative cosmetics. The intention here was firstly to obtain storage-stable preparations which can be formulated without severe restrictions, and secondly an increase in the effect of the pharmaceutical and/or cosmetic ingredient was desired.

In particular, the performance properties of hair care compositions were to be improved.

We have found that these objects are achieved by preparations comprising at least one polymer obtainable by free-radical polymerization of a monomer mixture of ethylenically unsaturated monomers in the presence of polyalkylene oxide-containing silicones and another polymer.

The invention provides preparations which comprise these polymers and another polymer, the other polymer being chosen from the group formed from

polyvinylpyrrolidones;
polyvinylcaprolactams;
polyurethanes;
copolymers of acrylic acid, methyl methacrylate, octylacrylamide, butylaminoethyl methacrylate and hydroxypropyl methacrylate;
copolymers of tert-butyl acrylate, ethyl acrylate and methacrylic acid;
copolymers of ethyl acrylate and methacrylic acid;
copolymers of N-tert-butylacrylamide, ethyl acrylate and acrylic acid;
copolymers of vinyl acetate and crotonic acid and/or (vinyl) neodecanoate;
copolymers of vinyl acetate and/or vinyl propionate and N-vinylpyrrolidone.

Surprisingly, we have found that preparations which comprise the polymers in combination with these other polymers have unexpected properties. The preparations according to the invention are superior to the prior art preparations with regard, in particular, to their skin care and hair care properties. In addition, they have very good film-forming and setting properties.

Copolymers of tert-butyl acrylate, ethyl acrylate and methacrylic acid (INCI name: Acrylates Copolymer) are available, for example, as the commercial products Luvimer™ 100 P, Luvimer™ 36 D, Luvimer™ 30 E (BASF).

Copolymers of ethyl acrylate and methacrylic acid (INCI name: Acrylates Copolymer) are available, for example, as the commercial products Luviflex™ Soft (BASF).

Copolymers of N-tert-butylacrylamide, ethyl acrylate and acrylic acid (INCI name: Acrylates/Acrylamide Copolymer) are available, for example, as the commercial products Ultrahold Strong™, Ultrahold 8™ (BASF).

Polyvinylpyrrolidones (INCI name: PVP) are available, for example, under the trade names Luviskol K™, Luviskol K 30™ (BASF) and PVP K (ISP).

Polyvinylcaprolactams (INCI: Polyvinylcaprolactams) are available, for example, under the trade name Luviskol Plus™ (BASF).

Copolymers of vinyl acetate and crotonic acid (INCI: VA/Crotonate/Copolymer) are available, for example, under the trade names Luviset CA 66™ (BASF), Resyn™ 28-1310 (National Starch) and Aristoflex™ A (Celanese).

Copolymers of vinyl acetate, crotonic acid and (vinyl) neodecanoates (INCI: VA/Crotonates/Neodecanoate Copolymer) are available, for example, under the trade names Resyn™ 28-2930 (National Starch) and Luviset™ CAN (BASF).

Copolymers of vinyl acetate and N-vinylpyrrolidone (INCI: PVP/VA) are available, for example, under the trade names Luviskol VA™ (BASF) and PVP/VA (ISP).

Polyurethanes (INCI: Polyurethane -1) are available, for example, under the trade name Luviset™ PUR.

Copolymers of acrylic acid, methyl methacrylate, octylacrylamide, butylaminoethyl methacrylate, hydroxypropyl methacrylate (INCI: Octylacrylamide/Acrylates/Butylaminoethyl Methacrylate Copolymer) are known, for example, under the trade names Amphomer™ 28-4910 and Amphomer™ LV-71 (National Starch).

Particularly preferred as the other polymer are those copolymers which contain vinyl acetate.

The invention further relates to the use of these preparations in cosmetic and/or pharmaceutical preparations.

The invention further provides preparations which comprise the polymers and at least one UV light protection filter, and to their use in cosmetic and/or pharmaceutical preparations.

The light protection filters used in cosmetic and pharmaceutical preparations have the task of preventing or at least diminishing the extent of the harmful effects of sunlight on the human skin. In addition, these light protection filters, however, also serve to protect their ingredients from decomposition or degradation by UV radiation. In hair cosmetic formulations, the aim is to prevent damage to the keratin fibers by UV rays.

The sunlight which reaches the Earth's surface has a proportion of UV-B radiation (280 to 320 nm) and of UV-A radiation (u 320 nm), which directly border the visible light region. The effect on the human skin is evident, particularly in the case of UV-B radiation, from sunburn.

The erythema activity maximum of sunlight is given as the relatively narrow region around 308 nm.

To protect against UVB radiation, numerous compounds are known; these are, inter alia, derivatives of 3-benzylidenecamphor, of 4-aminobenzoic acid, of cinnamic acid, of salicylic acid, of benzophenone, and of 2-phenylbenzimidazole.

For the region between about 320 nm and about 400 nm, the UVA region, it is also important to have available filter substances since the rays of that region can trigger reactions in cases of light-sensitive skin. It has been found that UVA radiation leads to damage of the elastic and collagenous fibers of connective tissue, which leads to premature aging of the skin, and that it is to be regarded as a cause of numerous phototoxic and photoallergic reactions. The harmful effect of UVB radiation can be intensified by UVA radiation.

Although a large number of preparations containing UV light protection filters are known in the prior art, there is a need for improved preparations with regard to the following properties: stability of the formulations, stability of the UV light protection filters, attainment of the highest possible light protection factors coupled with the lowest possible concentrations of UV light protection filters. The prior art preparations have, in particular, unsatisfactory adhesion of the UV light protection filters to skin and hair.

This means that a lasting protection of skin and hair cannot be ensured. One object is therefore to provide preparations which do not have said disadvantages. Moreover, it should be possible to incorporate the preparations into customary formulations without problems.

These objects are achieved by preparations comprising

- polymer obtainable by free-radical polymerization of a monomer mixture of

  (a) ethylenically unsaturated monomers

  (b) polyalkylene oxide-containing silicone derivatives

- UV light protection filters.

UV light protection filters which may be used are oil-soluble organic UV-A filters and/or UV-B filters and/or water-soluble organic UV-A filters and/or UV-B filters. The total amount of UV light protection filters is usually 0.1% by weight to 30% by weight, preferably 0.5 to 15% by weight, in particular 1 to 10% by weight, based on the total weight of the preparations.

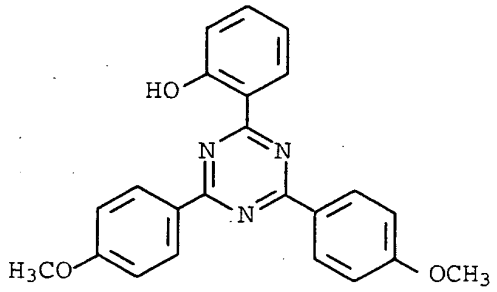
The UV light protection filters are advantageously chosen such that the preparations protect the skin from the entire range of ultraviolet radiation.

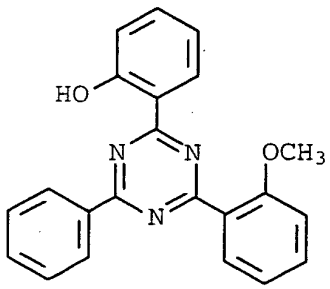
Examples thereof are:

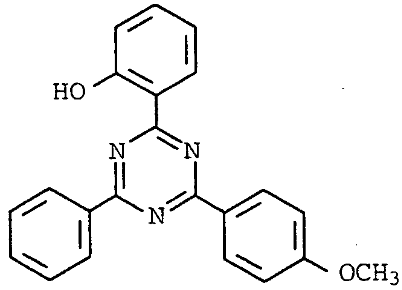
No.	Substance	CAS No. (=acid)
1	4-Aminobenzoic acid	150-13-0
2	3-(4'-Trimethylammonium) benzylidenebornan-2-one methylsulfate	52793-97-2
3	3,3,5-Trimethylcyclohexyl salicylate (homosalate)	118-56-9
4	2-Hydroxy-4-methoxybenzophenone (oxybenzone)	131-57-7
5	2-Phenylbenzimidazole-5-sulfonic acid and its potassium, sodium and triethanolamine salts	27503-81-7
6	3,3'-(1,4-Phenylenedimethine)bis(7,7-dimethyl-2-oxobicyclo[2.2.1]heptane-1-methanesulfonic acid) and its salts	90457-82-2
7	Polyethoxyethyl 4-bis(polyethoxy)aminobenzoate	113010-52-9
8	2-Ethylhexyl 4-dimethylaminobenzoate	21245-02-3
9	2-Ethylhexyl salicylate	118-60-5
10	4-Isoamyl 4-methoxycinnamate	71617-10-2
11	2-Ethylhexyl 4-methoxycinnamate	5466-77-3
12	2-Hydroxy-4-methoxybenzophenone-5-sulfonic acid (sulisobenzone) and the sodium salt	4065-45-6
13	3-(4'-Sulfo)benzylidenebornan-2-one and salts	58030-58-6
14	3-Benzylidenebornan-2-one	16087-24-8
15	1-(4'-Isopropylphenyl)-3-phenylpropane-1,3-dione	63260-25-9
16	4-Isopropylbenzyl salicylate	94134-93-7
17	2,4,6-Trianilino(o-carbo-2'-ethylhexyl-1'-oxy)-1,3,5-triazine	88122-99-0
18	3-Imidazol-4-ylacrylic acid and its ethyl ester	104-98-3
19	Menthyl o-aminobenzoate or: 5-methyl-2-(1-methylethyl)-2-aminobenzoate	134-09-8
20	Glyceryl p-aminobenzoate or: 1-glyceryl 4-aminobenzoate	136-44-7

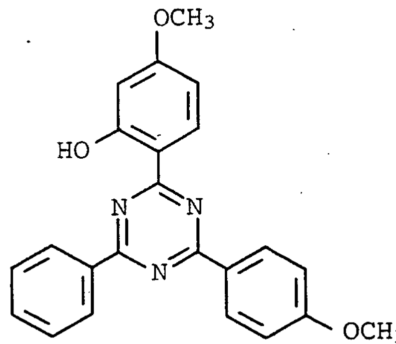
No.	Substance	CAS No. (=acid)
21	2,2'-Dihydroxy-4-methoxybenzophenone (dioxybenzone)	131-53-3
22	2-Hydroxy-4-methoxy-4-methylbenzophenone (mexenone)	1641-17-4
23	Triethanolamine salicylate	2174-16-5
24	Dimethoxyphenylglyoxalic acid or: sodium 3,4-dimethoxyphenylglyoxalate	4732-70-1
25	3-(4'-Sulfo)benzylidenebornan-2-one and its salts	56039-58-8
26	2,2',4,4'-Tetrahydroxybenzophenone	131-55-5
27	2,2'-Methylenebis[6(2H-benzotriazol-2-yl)-4-(1,1,3,3-tetramethylbutyl)phenol]	103597-45-1
28	2,2'-(1,4-Phenylene)bis-1H-benzimidazole-4,6-disulfonic acid, Na salt	180898-37-7
29	2,4-Bis[4-(2-ethylhexyloxy)-2-hydroxy]phenyl-6-(4-methoxyphenyl)-(1,3,5)triazine	187393-00-6
30	3-(4-Methylbenzylidene)camphor	36861-47-9
31	Polyethoxyethyl 4-bis(polyethoxy)paraaminobenzoate	113010-52-9
32	2,4-Dihydroxybenzophenone	131-56-6
33	2,2'-Dihydroxy-4,4'-dimethoxybenzophenone-5,5'-disodium sulfonate	3121-60-6

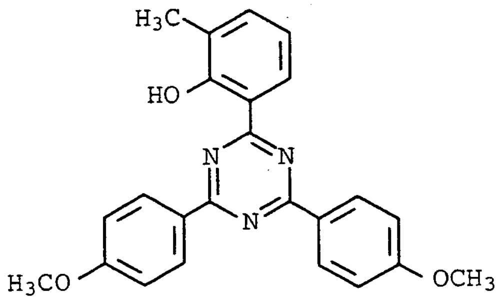
Other combinable light protection agents are, inter alia, the following compounds:

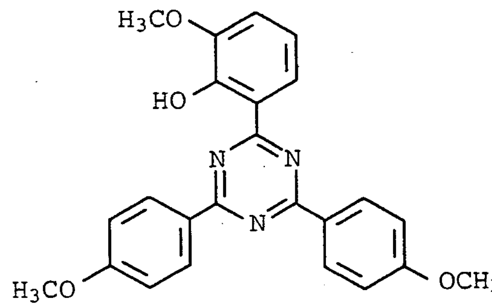


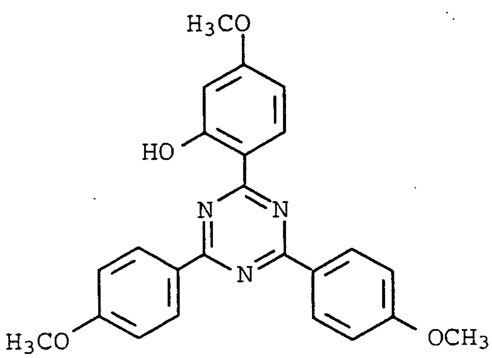


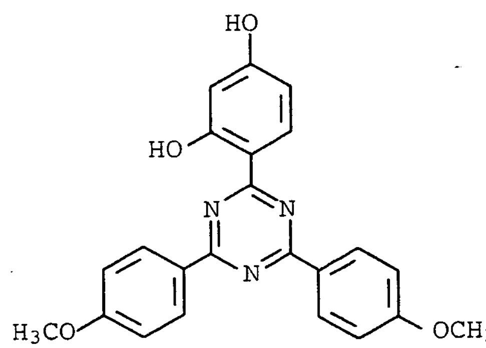


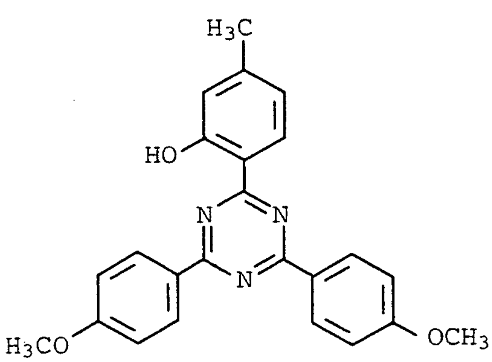


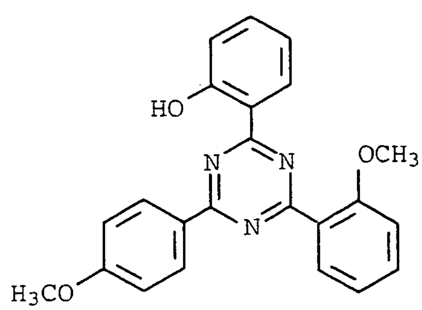


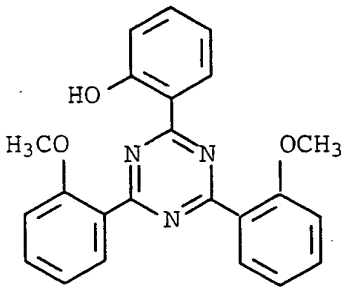


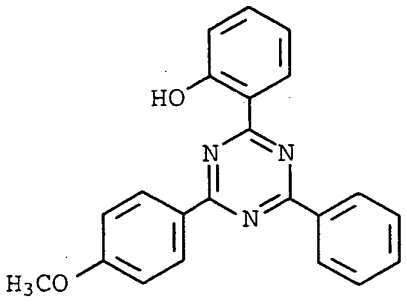


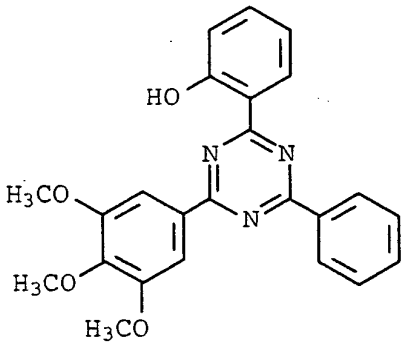


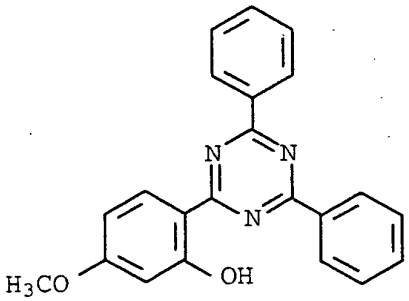


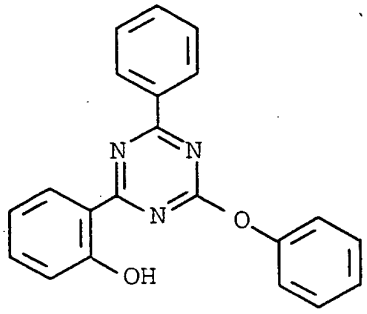


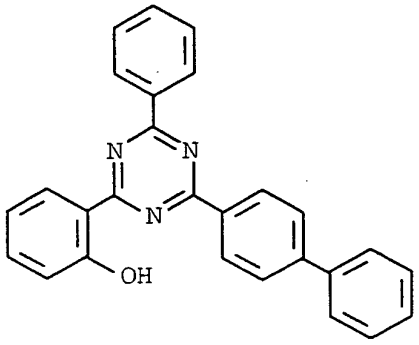


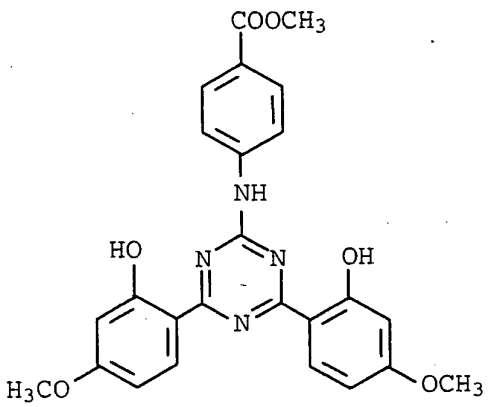


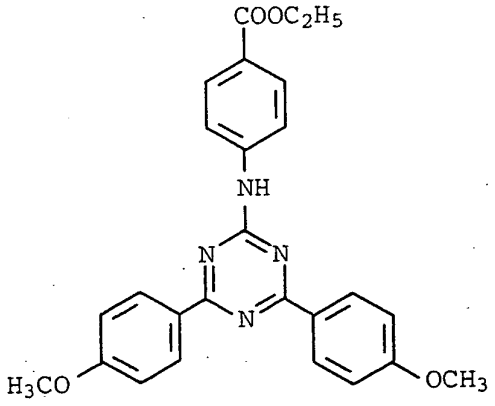


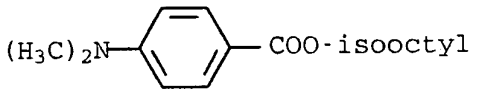


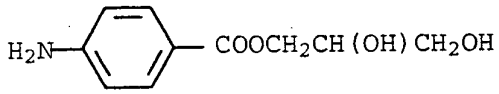


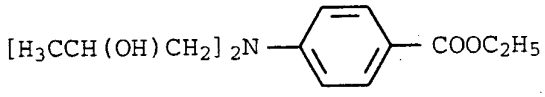


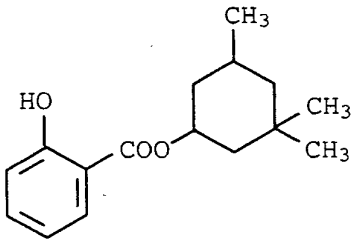


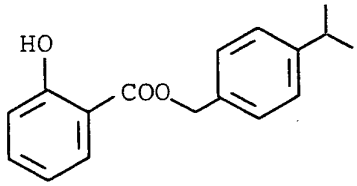


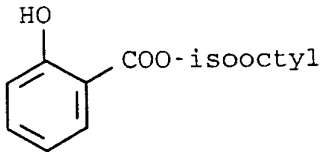












The list of UV light protection filters mentioned which can be used in combination with the addition polymers according to the invention is not of course intended to be limiting.

The invention further provides for the use of these preparations in cosmetic and/or pharmaceutical preparations.

Polymers

Suitable polymerizable monomers (a) are ethylenically unsaturated monomers. In this connection, it is possible to use either individual monomers or combinations of two or more monomers.

Monomers which can be polymerized with a reaction initiated by free radicals are preferred. The term ethylenically unsaturated means that the monomers have at least one polymerizable carbon-carbon double bond which can be mono-, di-, tri- or tetrasubstituted.

The ethylenically unsaturated monomers (a) can be described by the following formula:

$$X\text{-}C(O)CR^7=CHR^6$$

where

X is chosen from the group of radicals -OH, -OM, $-OR^8$, NH_2, $-NHR^8$, $N(R^8)_2$;

M is a cation chosen from the group consisting of: Na+, K+, Mg++, Ca++, Zn++, NH_4+, alkylammonium, dialkylammonium, trialkylammonium and tetraalkylammonium;

the radicals R^8 may be identical or different chosen from the group consisting of -H, C_1-C_{40} linear or branched-chain alkyl radicals, N,N-dimethylaminoethyl, 2-hydroxyethyl, 2-methoxyethyl, 2-ethoxyethyl, hydroxypropyl, methoxypropyl or ethoxypropyl.

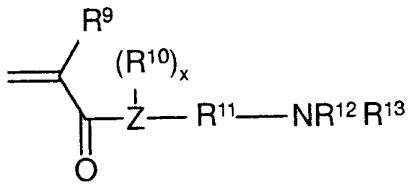
R^7 and R^6 are, independently of one another, chosen from the group consisting of: -H, C_1-C_8 linear or branched-chain alkyl chains, methoxy, ethoxy, 2-hydroxyethoxy, 2-methoxyethoxy and 2-ethoxyethyl.

Representative but nonlimiting examples of suitable monomers (a) are, for example, acrylic acid and salts thereof, esters and amides. The salts can be derived from any desired nontoxic metal, ammonium or substituted ammonium counterions.

The esters can be derived from C_1-C_{40} linear, C_3-C_{40} branched-chain or C_3-C_{40} carbocyclic alcohols, from polyfunctional alcohols having 2 to about 8 hydroxyl groups, such as ethylene glycol, hexylene glycol, glycerol, and 1,2,6-hexanetriol, from

aminoalcohols or from alcohol ethers, such as methoxyethanol and ethoxyethanol, or polyethylene glycols.

Also suitable are N,N-dialkylaminoalkyl acrylates and methacrylates and N-dialkylaminoalkylacryl- and -methacrylamides of the formula (II)



(II)

where R^9 = H, alkyl having 1 to 8 carbon atoms,
R^{10} = H, methyl,
R^{11} = alkylene having 1 to 24 carbon atoms, optionally substituted by alkyl,
R^{12}, R^{13} = C_1-C_{40} alkyl radical,
Z = nitrogen where x = 1, or oxygen where x = 0

The amides can be unsubstituted, N-alkyl- or N-alkylamino mono-substituted, or N,N-dialkyl-substituted or N,N-dialkylamino-disubstituted, wherein the alkyl or alkylamino groups are derived from C_1-C_{40} linear, C_3-C_{40} branched-chain or C_3-C_{40} carbocyclic units. Additionally, the alkylamino groups can be quaternized.

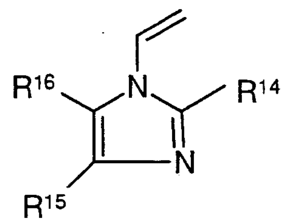
Preferred monomers of the formula II are N,N-dimethylaminomethyl (meth)acrylate, N,N-diethylaminomethyl (meth)acrylate, N,N-dimethylaminoethyl (meth)acrylate, N,N-diethylaminoethyl (meth)acrylate.

Further monomers (a) which can be used are substituted acrylic acids, and salts, esters and amides thereof, where the substituents on the carbon atoms are in the two or three position of the acrylic acid, and, independently of one another, are chosen from the group consisting of C_1-C_4 alkyl, -CN, COOH, particularly preferably methacrylic acid, ethacrylic acid and 3-cyanoacrylic acid. These salts, esters and amides of these substituted acrylic acids can be chosen as described above for the salts, esters and amides of acrylic acid.

Other suitable monomers (a) are vinyl and allyl esters of C_1-C_{40} linear, C_3-C_{40} branched-chain or C_3-C_{40} carbocyclic carboxylic acids (e.g.: vinyl acetate, vinyl propionate, vinyl neononanoate, vinyl neoundecanoate or vinyl t-butylbenzoate); vinyl or allyl

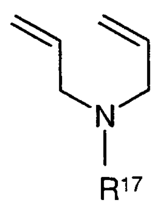
halides, preferably vinyl chloride and allyl chloride, vinyl ethers, preferably methyl, ethyl, butyl or dodecyl vinyl ethers, vinyl formamide, vinylmethylacetamide, vinylamine; vinyllactams, preferably vinylpyrrolidone and vinylcaprolactam, vinyl- or allyl-substituted heterocyclic compounds, preferably vinylpyridine, vinyloxazoline and allylpyridine.

Also suitable are N-vinylimidazoles of the formula III, in which R^{14} to R^{16}, independently of one another, are hydrogen, C_1-C_4-alkyl or phenyl:



(III)

Further suitable monomers (a) are diallylamines of the formula (IV)



(IV)

where R^{17} = C_1-C_{24} alkyl

Further suitable monomers (a) are vinylidene chloride; and hydrocarbons having at least one carbon-carbon double bond, preferably styrene, alpha-methylstyrene, tert-butylstyrene, butadiene, isoprene, cyclohexadiene, ethylene, propylene, 1-butene, 2-butene, isobutylene, vinyltoluene, and mixtures of these monomers.

Particularly suitable monomers (a) are acrylic acid, methacrylic acid, ethylacrylic acid, methyl acrylate, ethyl acrylate, propyl acrylate, n-butyl acrylate, isobutyl acrylate, t-butyl acrylate, 2-ethylhexyl acrylate, decyl acrylate, methyl methacrylate, ethyl methacrylate, propyl methacrylate, n-butyl methacrylate, isobutyl methacrylate, t-butyl methacrylate, 2-ethylhexyl methacrylate, decyl methacrylate, methyl ethacrylate, ethyl ethacrylate, n-butyl ethacrylate, isobutyl ethacrylate, t-butyl ethacrylate, 2-ethylhexyl ethacrylate, decyl ethacrylate, 2,3-dihydroxypropyl acrylate, 2,3-dihydroxypropyl methacrylate, 2-hydroxyethyl acrylate, hydroxypropyl acrylate, 2-hydroxyethyl methacrylate, 2-hydroxyethyl ethacrylate, 2-methoxyethyl acrylate, 2-methoxyethyl methacrylate, 2-methoxyethyl ethacrylate,

2-ethoxyethyl methacrylate, 2-ethoxyethyl ethacrylate, hydroxypropyl methacrylate, glyceryl monoacrylate, glyceryl monomethacrylate, polyalkylene glycol (meth)acrylates, unsaturated sulfonic acids, such as, for example, acrylamidopropanesulfonic acid;

acrylamide, methacrylamide, ethacrylamide, N-methylacrylamide, N,N-dimethylacrylamide, N-ethylacrylamide, N-isopropylacrylamide, N-butylacrylamide, N-t-butylacrylamide, N-octylacrylamide, N-t-octylacrylamide, N-octadecylacrylamide, N-phenylacrylamide, N-methylmethacrylamide, N-ethylmethacrylamide, N-dodecylmethacrylamide, 1-vinylimidazole, 1-vinyl-2-methylimidazole, N,N-dimethylaminomethyl (meth)acrylate, N,N-diethylaminomethyl (meth)acrylate, N,N-dimethylaminoethyl (meth)acrylate, N,N-diethylaminoethyl (meth)acrylate, N,N-dimethylaminobutyl (meth)acrylate, N,N-diethylaminobutyl (meth)acrylate, N,N-dimethylaminohexyl (meth)acrylate, N,N-dimethylaminooctyl (meth)acrylate, N,N-dimethylaminododecyl (meth)acrylate, N-[3-(dimethylamino)propyl]methacrylamide, N-[3-(dimethylamino)propyl]acrylamide, N-[3-(dimethylamino)butyl]methacrylamide, N-[8-(dimethylamino)octyl]methacrylamide, N-[12-(dimethylamino)dodecyl]methacrylamide, N-[3-(diethylamino)propyl]methacrylamide, N-[3-(diethylamino)propyl]acrylamide;

maleic acid, fumaric acid, maleic anhydride and its monoesters, crotonic acid, itaconic acid, diallyldimethylammonium chloride, vinyl ethers (for example: methyl, ethyl, butyl or dodecyl vinyl ethers), vinylformamide, vinylmethylacetamide, vinylamine; methyl vinyl ketone, maleimide, vinylpyridine, vinylimidazole, vinylfuran, styrene, styrene sulfonate, allyl alcohol, and mixtures thereof.

Of these, particular preference is given to acrylic acid, methacrylic acid, maleic acid, fumaric acid, crotonic acid, maleic anhydride and monoesters thereof, methyl acrylate, methyl methacrylate, ethyl acrylate, ethyl methacrylate, n-butyl acrylate, n-butyl methacrylate, t-butyl acrylate, t-butyl methacrylate, isobutyl acrylate, isobutyl methacrylate, 2-ethylhexyl acrylate, N-t-butylacrylamide, N-octylacrylamide, 2-hydroxyethyl acrylate, hydroxypropyl acrylate, 2-hydroxyethyl methacrylate, hydroxypropyl methacrylate, alkylene glycol (meth)acrylates, unsaturated sulfonic acids, such as, for example, acrylamidopropanesulfonic acid, vinylpyrrolidone, vinylcaprolactam, vinyl ethers (e.g.: methyl, ethyl, butyl or

dodecyl vinyl ethers), vinylformamide, vinylmethylacetamide, vinylamine, 1-vinylimidazole, 1-vinyl-2-methylimidazole, N,N-dimethylaminomethyl methacrylate and N-[3-(dimethylamino)propyl]methacrylamide; 3-methyl-1-vinylimidazolium chloride, 3-methyl-1-vinylimidazolium methyl sulfate, N,N-dimethylaminoethyl methacrylate, N-[3-(dimethylamino)propyl]methacrylamide quaternized with methyl chloride, methyl sulfate or diethyl sulfate.

In a very particularly preferred embodiment, the monomers (a) used are t-butyl acrylate (=a1) and methacrylic acid (=a2).

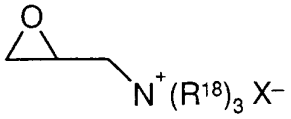
Monomers containing a basic nitrogen atom can be quaternized here in the following way:

For quaternizing the amines, alkyl halides having 1 to 24 carbon atoms in the alkyl group, e.g. methyl chloride, methyl bromide, methyl iodide, ethyl chloride, ethyl bromide, propyl chloride, hexyl chloride, dodecyl chloride, lauryl chloride and benzyl halides, in particular benzyl chloride and benzyl bromide, are suitable. Further suitable quaternizing agents are dialkyl sulfates, in particular dimethyl sulfate or diethyl sulfate. The quaternization of the basic amines can also be carried out with alkylene oxides, such as ethylene oxide or propylene oxide, in the presence of acids. Preferred quaternizing agents are: methyl chloride, dimethyl sulfate or diethyl sulfate.

In a preferred embodiment, the monomers (a) used are (meth)acrylates.

The quaternization can be carried out before the polymerization or after the polymerization.

Moreover, the reaction products of unsaturated acids, such as, for example, acrylic acid or methacrylic acid, with a quaternized epichlorohydrin of the formula (V) can be used (R^{18} = C1 to C40 alkyl).



(V)

Examples thereof are:
(meth)acryloyloxyhydroxypropyltrimethylammonium chloride and
(meth)acryloyloxyhydroxypropyltriethylammonium chloride.

The basic monomers can also be cationized, by neutralizing them with mineral acids, such as, for example, sulfuric acid, hydrochloric acid, hydrobromic acid, hydroiodic acid, phosphoric acid or nitric acid, or with organic acids, such as, for example, formic acid, acetic acid, lactic acid or citric acid.

In addition to the abovementioned monomers, it is also possible to use, as monomers (a), macromonomers, such as, for example, silicone-containing macromonomers containing one or more free-radically polymerizable groups, or alkyloxazoline macromonomers, as are described, for example, in EP 408 311.

Furthermore, it is also possible to use fluorine-containing monomers, as are described, for example, in EP 558423, or compounds which have a crosslinking action or regulate the molecular weight, in combination or alone.

Regulators which can be used are the customary compounds known to the person skilled in the art, such as, for example, sulfur compounds (e.g.: mercaptoethanol, 2-ethylhexyl thioglycolate, thioglycolic acid or dodecyl mercaptan), and tribromochloromethane or other compounds which have a regulating effect on the molecular weight of the resulting addition polymers. Where appropriate, it is also possible to use thiol-containing silicone compounds. Preference is given to using silicone-free regulators.

Crosslinking monomers which can be used are compounds having at least two ethylenically unsaturated double bonds, such as, for example, esters of ethylenically unsaturated carboxylic acids, such as acrylic acid or methacrylic acid and polyhydric alcohols, ethers of at least dihydric alcohols, such as, for example, vinyl ether or allyl ether. Also suitable are straight-chain or branched, linear or cyclic aliphatic or aromatic hydrocarbons which have at least two double bonds which, in the case of the aliphatic hydrocarbons, must not be conjugated. Also suitable are amides of acrylic and methacrylic acid and N-allylamines of at least difunctional amines, such as, for example, 1,2-diaminoethane and 1,3-diaminopropane. Also suitable are triallylamine or corresponding ammonium salts, N-vinyl compounds or urea derivatives, at least difunctional amides, cyanurates or

urethanes. Other suitable crosslinkers are divinyldioxane, tetraallylsilane or tetravinylsilane.

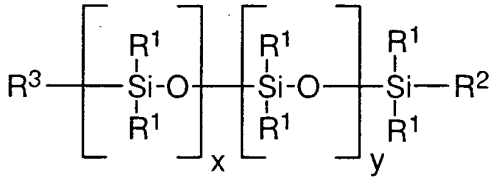
Particularly preferred crosslinkers are, for example, methylenebisacrylamide, triallylamine and triallylammonium salts, divinylimidazole, N,N'-divinylethyleneurea, reaction products of polyhydric alcohols with acrylic acid or methacrylic acid, methacrylic esters and acrylic esters of polyalkylene oxides or polyhydric alcohols which have been reacted with ethylene oxide and/or propylene oxide and/or epichlorohydrin.

The monomers (a) according to the invention can, if they contain ionizable groups, be partially or completely neutralized using acids or bases, before or after the polymerization, in order thus, for example, to adjust the water-solubility or -dispersibility to a desired level.

Neutralizing agents for acid-group-carrying monomers which can be used are, for example, mineral bases, such as sodium carbonate, alkali metal hydroxides, and ammonia, organic bases, such as aminoalcohols, specifically 2-amino-2-methyl-1-propanol, monoethanolamine, diethanolamine, triethanolamine, triisopropanolamine, tri[(2-hydroxy)-1-propyl]amine, 2-amino-2-methyl-1,3-propanediol, 2-amino-2-hydroxymethyl-1,3-propanediol, and diamines, such as, for example lysine.

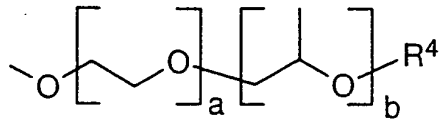
Neutralizing agents for cationizable-group-carrying monomers which can be used are, for example, mineral acids, such as hydrochloric acid, sulfuric acid or phosphoric acid, and organic acids, such as carboxylic acids, lactic acid, citric acid or others.

Particularly suitable polyalkylene oxide-containing silicone derivatives (b) are those which contain the following structural elements:



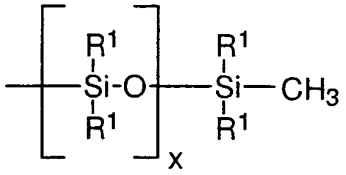
(1)

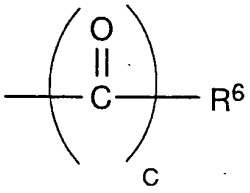
where:

$R^2 = CH_3$ or 

$R^3 = CH_3$ or R^2

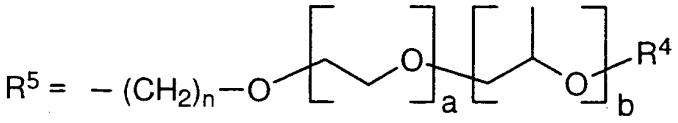
$R^4 = H, CH_3,$





R^6 is an organic radical having 1 to 40 carbon atoms which can contain amino, carboxylic acid or sulfonate groups, or, for the case c=0, is also the anion of an inorganic acid,

and where the radicals R^1 may be identical or different, and either originate from the group of aliphatic hydrocarbons having 1 to 20 carbon atoms, are cyclic aliphatic hydrocarbons having 3 to 20 carbon atoms, are of an aromatic nature or are identical to R^5, where:

$R^5 =$ 

with the proviso that at least one of the radicals R^1, R^2 or R^3 is a polyalkylene oxide-containing radical according to the above definition,
and n is an integer from 1 to 6,
x and y are integers such that the molecular weight of the polysiloxane block is between 300 and 30,000,
a, b may be integers between 0 and 50, with the proviso that the sum of a and b is greater than 0, and c is 0 or 1.

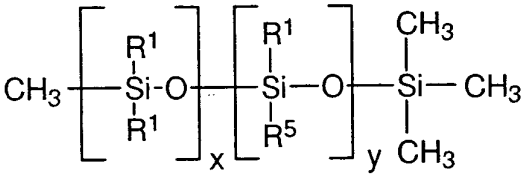
Preferred radicals R^2 and R^5 are those in which the sum a+b is between 5 and 30.

The groups R^1 are preferably chosen from the following group: methyl, ethyl, propyl, butyl, isobutyl, pentyl, isopentyl, hexyl, octyl, decyl, dodecyl and octadecyl, cycloaliphatic radicals, specifically cyclohexyl, aromatic groups, specifically phenyl or naphthyl, mixed aromatic-aliphatic radicals, such as benzyl or phenylethyl, and tolyl and xylyl and R^5.

Particularly suitable radicals R^4 are those in which, in the case where $R^4 = -(CO)_c-R^6$, R^6 is any alkyl, cycloalkyl or aryl radical which has between 1 and 40 carbon atoms and which can carry further ionogenic groups, such as NH_2, COOH and SO_3H.

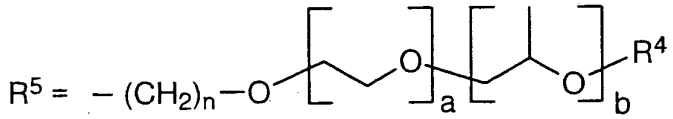
Preferred inorganic radicals R^6 are, where c=O, phosphate and sulfate.

In a particularly preferred embodiment of the present invention, compounds according to the following formula are used as polyalkylene oxide-containing silicone derivative (b):



where

$R^1 = -CH_3$



R^4 = -H; $-COCH_3$, alkyl with C_1-C_4

n = 1 to 6, in particular 2 to 4, preferably 3

x and y are integers such that the molecular weight of the polysiloxane block is between 1000 and 5000,
a, b may be integers between 0 and 50, with the proviso that the sum of a and b is greater than 0.

Such particularly preferred silicone derivatives are known under the CAS No. 872 44-72-2. Commercial products are those available under the names Belsil DMC 6031™ (Wacker), Dabco DC 193,

Dabco DC 5357, Dow Corning 198™, Dow Corning 5039™ and Silwet 7600™ (Witco).

Such particularly preferred silicone derivatives are known under the CAS No. 71965-38-3. Commercial products which are available are those under the names Abil B 8842, Abil B 8843, Silwet L 7607 (Witco).

Also particularly preferred are those silicone derivatives available under the trade names Belsil DMC 6032™ (Wacker) and Dow Corning 190™ (Dow Chemicals).

The monomers (a) of the polysiloxane-containing polymers of the present invention may constitute from 50 to 99.9% by weight, preferably 70 to 99% by weight, particularly preferably 85 to 98% by weight. If the ethylenically unsaturated monomers (a) are used as a combination of two monomers (a1 and a2), it has proven advantageous to use 49.5 to 99% by weight of (a1) and 0.5 to 40% by weight of (a2).

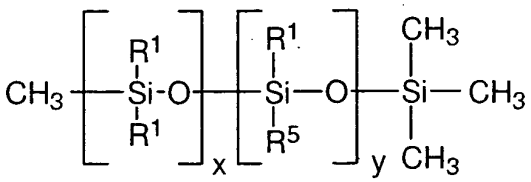
The silicone derivatives (b) are usually present in the addition polymer according to the invention in amounts of from 0.1 to 50% by weight, preferably from 0.5 to 20% by weight, particularly preferably from 2 to 15% by weight.

In a particularly preferred embodiment, an polymer is used which is obtainable by free-radical polymerization of a monomer mixture of

(a1) 49.5 to 99% by weight of (meth)acrylate, in particular tert-butyl acrylate

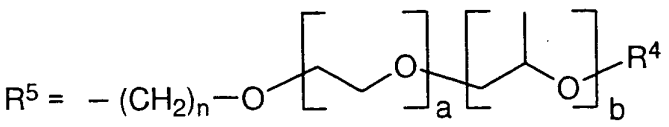
(a2) 0.5 to 40% by weight of another (meth)acrylate, in particular methacrylic acid

(b) 0.5 to 20% by weight of a polyalkylene oxide-containing silicone derivative according to the following formula:



where

R^1 = $-CH_3$



R^4 = -H; $-COCH_3$, alkyl with C_1-C_4

n = 1 to 6, in particular 2 to 4, preferably 3

x and y are integers such that the molecular weight of the polysiloxane block is between 1000 and 5000,

a, b may be integers between 0 and 50, with the proviso that the sum of a and b is greater than 0.

If the silicone compounds (b) are not present during the polymerization, but are mixed in after the polymerization, very soft tacky films are usually obtained which are unsuitable for the uses according to the invention in cosmetics for skin and hair.

This indicates that, during the polymerization, possible grafting of the addition polymers to the silicone compounds can occur, contributing to the good film properties, such as freedom from tack, high surface smoothness and hardness, and improved block strength. However, mechanisms other than grafting by means of which the polymers according to the invention can achieve their advantageous properties are also conceivable.

The term "polymerizable" means that the monomers used can be polymerized using any conventional synthetic method.

For example, this can be solution polymerization, emulsion polymerization, inverse emulsion polymerization, suspension polymerization, inverse suspension polymerization or precipitation polymerization, without limiting the methods which can be used thereto. In solution polymerization, it is possible to use water, customary organic solvents or the silicone derivatives according to the invention themselves as solvent.

The polymers according to the invention preferably have a K value (measured in accordance with Fickentscher, Cellulosechemie, Vol. 13, pp. 58-64 (1932) at 250°C as a 0.1 5% strength solution in 0.5 molar sodium chloride solution) of 30 to 50, preferably 37 to 41.

Particularly suitable polymers are those which are soluble in water or whose water dispersibility is large enough for them to be soluble in a water:ethanol = 20:80 (% by volume:% by volume) solvent mixture in an amount of more than 0.1 g/l, preferably more than 0.2 g/l.

For the purposes of the invention, "water-dispersible" polymers are those which, upon contact with water, form a fluid within 24 hours, within which no solid particles can be detected with the eye without optical devices. To check whether an polymer is water-dispersible, 100 mg of the addition polymer, in the form of a 100 μm-thick film, are added to 100 ml of water (20°C) and shaken for 24 hours on a commercially available shaker table. If, after the shaking, solid particles can no longer be recognized, but the fluid has turbidity, the addition polymer is water-dispersible; in the absence of turbidity, it is referred to as water-soluble.

During the polymerization of the monomers, it is also possible, where appropriate, for other polymers, such as, for example, homo- and copolymers of ethylenically unsaturated monomers, and polyamides, polyurethanes or polyesters, to be present. The polyamides, polyurethanes, polyesters have preferably been ionically modified, e.g. with carboxylate or sulfonate groups.

A particularly preferred polymer according to the invention is, for example, an polymer available under the trade name Luviflex™ Silk (INCI Name: PEG/PPG-25/25 Dimethicone/Acrylates/t-Butyl Acrylates; BASF Aktiengesellschaft).

The preparations according to the invention can be present in end preparations as aqueous or aqueous-alcoholic solutions, O/W and W/O emulsions in the form of shampoos, cremes, foams, lotion, mousse, sprays (pump spray or aerosol), gels or gel sprays, and are accordingly formulated with customary further auxiliaries.

Further customary auxiliaries which may be mentioned are: surfactants, oily substances, emulsifiers, coemulsifiers, super fatting agents, perlescent waxes, bodying agents, thickeners, fats, waxes, silicone compounds, hydrotropic agents, preservatives, perfume oils, dyes, stabilizers, pH regulators, cosmetic care substances and active ingredients, such as AHA acids, fruit acids, ceramides, phytantriol, bisabolol, panthenol, collagen, provitamins and vitamins, e.g. vitamin A, E and C, proteins and protein hydrolysates (e.g. wheat, almond or pea proteins), solubilizers, complexing agents, repellents, bleaches, colorants, tinting agents, tanning agents (e.g.

dihydroxyacetone), micropigments, such as titanium dioxide or zinc oxide and the like. In addition, polymers may be present.

Suitable anionic surfactants are, for example, alkyl sulfates, alkyl ether sulfates, alkylsulfonates, alkylarylsulfonates, alkyl succinates, alkyl sulfosuccinates, N-alkyl sarcosinates, acyl taurates, acyl isethionates, alkyl phosphates, alkyl ether phosphates, alkyl ether carboxylates, alpha-olefinsulfonates, in particular the alkali metal and alkaline earth metal salts, e.g. sodium, potassium, magnesium, calcium and ammonium and triethanolamine salts. The alkyl ether sulfates, alkyl ether phosphates and alkyl ether carboxylates can have between 1 and 10 ethylene oxide or propylene oxide units, preferably 1 to 3 ethylene oxide units, in the molecule.

Suitable are, for example, sodium lauryl sulfate, ammonium lauryl sulfate, sodium lauryl ether sulfate, ammonium lauryl ether sulfate, sodium lauryl sarcosinate, sodium oleyl succinate, ammonium lauryl sulfosuccinate, sodium dodecyl benzenesulfonate, triethanolamine dodecylbenzenesulfonates.

Suitable amphoteric surfactants are, for example, alkylbetaines, alkylamidopropylbetaines, alkylsulfobetaines, alkyl glycinates, alkyl carboxyglycinates, alkyl amphoacetates or -propionates, alkyl amphodiacetates, or -dipropionates.

For example, cocodimethylsulfopropylbetaine, laurylbetaine, cocamidopropylbetaine or sodium cocamphopropionate may be used.

Suitable as nonionic surfactants are, for example, the reaction products of aliphatic alcohols or alkylphenols having 6 to 20 carbon atoms in the alkyl chain, which may be linear or branched, with ethylene oxide and/or propylene oxide. The amount of alkylene oxide is about 6 to 60 mol per mole of alcohol. Also suitable are alkylamine oxides, mono- or dialkylalkanolamides, fatty acid esters of polyethylene glycols, ethoxylated fatty acid amides, alkyl polyglycosides or sorbitan ether esters.

Furthermore, the compositions can comprise customary cationic surfactants, such as, for example, quaternary ammonium compounds, for example cetyltrimethylammonium chloride.

The compositions according to the invention, in particular in the form of shampoo formulations, usually comprise anionic surfactants as base surfactants and amphoteric and nonionic surfactants as cosurfactants.

The compositions usually comprise 2 to 50% by weight of surfactants, preferably 5 to 40% by weight, particularly preferably 8 to 30% by weight.

Suitable oily substances are, for example, Guerbet alcohols based on fatty alcohols having 6 to 18, preferably 8 to 10, carbon atoms, esters of linear C_6-C_{22}-fatty acids with linear C_6-C_{22}-fatty alcohols, esters of branched C_6-C_{13}-carboxylic acids with linear C_6-C_{22}-fatty alcohols, esters of linear C_6-C_{22}-fatty acids with branched alcohols, in particular 2-ethylhexanol, esters of hydroxycarboxylic acids with linear or branched C_6-C_{22}-fatty alcohols, in particular Dioctyl Malate, esters of linear and/or branched fatty acids with polyhydric alcohols (such as, for example, propylene glycol, dimerdiol or trimertriol) and/or Guerbet alcohols, triglycerides based on C_6-C_{10}-fatty acids, liquid mono/di/triglyceride mixtures based on C_6-C_{18}-fatty acids, esters of C_6-C_{22}-fatty alcohols and/or Guerbet alcohols with aromatic carboxylic acids, in particular benzoic acid, vegetable oils, branched primary alcohols, substituted cyclohexanes, linear and branched C_6-C_{22}-fatty alcohol carbonates, Guerbet carbonates, esters of benzoic acid with linear and/or branched C_6-C_{22}-alcohols (e.g. Finsolv® TN), linear or branched, symmetrical or unsymmetrical dialkyl ethers having 6 to 22 carbon atoms per alkyl group, ring-opening products of epoxidized fatty acid esters with polyols, silicone oils and/or aliphatic or naphthenic hydrocarbons.

Suitable oily substances are animal and vegetable oils, such as, for example, sunflower oil, coconut oil, avocado oil, olive oil or lanolin.

Suitable emulsifiers are, for example, nonionogenic surfactants from at least one of the following groups:

(1) addition products of from 2 to 30 mol of ethylene oxide and/or 0 to 5 mol of propylene oxide onto linear fatty alcohols having 8 to 22 carbon atoms, onto fatty acids having 12 to 22 carbon atoms and onto alkylphenols having 8 to 15 carbon atoms in the alkyl group;

(2) $C_{12/18}$-fatty acid mono-diesters of addition products of from 1 to 30 mol of ethylene oxide onto glycerol;

(3) glycerol mono-diesters and sorbitan mono-diesters of saturated and unsaturated fatty acids having 6 to 22 carbon atoms and the ethylene oxide addition products thereof;

(4) alkyl mono and oligoglycosides having 8 to 22 carbon atoms in the alkyl radical and ethoxylated analogs thereof;

(5) addition products of from 15 to 60 mol of ethylene oxide onto castor oil and/or hydrogenated castor oil;

(6) polyol esters and, in particular, polyglycerol esters, such as, for example, polyglycerol polyricinoleate, polyglycerol poly-12-hydroxystearate or polyglycerol dimerate. Also suitable are mixtures of compounds of two or more of these classes of substance;

(7) addition products of from 2 to 15 mol of ethylene oxide onto castor oil and/or hydrogenated castor oil;

(8) partial esters based on linear, branched, unsaturated or saturated $C_{6/22}$-fatty acids, ricinoleic acid, and 12-hydroxystearic acid and glycerol, polyglycerol, pentaerythritol, dipentaerythritol, sugar alcohols (e.g. sorbitol), alkylglucosides (e.g. methylglucoside, butylglucoside, laurylglucoside), and polyglucosides (e.g. cellulose);

(9) mono, di and trialkyl phosphates, and mono-, di- and/or tri-PEG-alkyl phosphates and salts thereof;

(10) wool wax alcohols;

(11) polysiloxane polyalkyl polyether copolymers and corresponding derivatives;

(12) mixed esters of pentaerythritol, fatty acids, citric acid and fatty alcohol according to German patent 1165574 and/or mixed esters of fatty acids having 6 to 22 carbon atoms, methylglycose and polyols, preferably glycerol or polyglycerol, and

(13) polyalkylene glycols.

The addition products of ethylene oxide and/or of propylene oxide onto fatty alcohols, fatty acids, alkylphenols, glycerol mono- and diesters, and sorbitan mono- and diesters of fatty acids or onto castor oil are known, commercially available products. They are homologue mixtures whose average degree of alkoxylation corresponds to the ratio of the amounts of ethylene oxide and/or propylene oxide and substrate with which the addition reaction is carried out. $C_{12/18}$-fatty acid mono- and diesters of addition

products of ethylene oxide onto glycerol are known from German patent 2024051 as refatting agents for cosmetic preparations. $C_{8/18}$-alkyl mono and oligoglycosides, their preparation and their use are known from the prior art. Their preparation takes place, in particular, by reacting glucose or oligosaccharides with primary alcohols having 8 to 18 carbon atoms. With regard to the glycoside ester, monoglycosides in which a cyclic sugar radical is bonded to the fatty alcohol glycosidically, and also oligomeric glycosides having a degree of oligomerization up to preferably about 8 are suitable. The degree of oligomerization here is a statistical average value which is based on a homologue distribution customary for such technical-grade products.

It is also possible for the emulsifiers used to be zwitterionic surfactants. Zwitterionic surfactants is the term used to refer to those surface-active compounds which carry at least one quaternary ammonium group and at least one carboxylate and one sulfonate group in the molecule. Particularly suitable zwitterionic surfactants are the so-called betaines, such as the N-alkyl-N,N-dimethylammonium glycinates, for example cocoalkyldimethylammonium glycinate, N-acylaminopropyl-N,N-dimethylammonium glycinates, for example cocoacylaminopropyldimethylammonium glycinate, and 2-alkyl-3-carboxymethyl-3-hydroxyethylimidazolines having in each case 8 to 18 carbon atoms in the alkyl or acyl group, and cocoacylaminoethyl hydroxyethylcarboxymethylglycinate. Particular preference is given to the fatty acid amide derivative known under the CTFA name Cocamidopropyl Betaine. Likewise suitable emulsifiers are ampholytic surfactants. Ampholytic surfactants are understood as meaning those surface-active compounds which, apart from a $C_{8/18}$-alkyl or acyl group in the molecule, contain at least one free amino group and at least one COOH or SO_3H group and are capable of forming internal salts. Examples of suitable ampholytic surfactants are N-alkylglycines, N-alkylpropionic acids, N-alkylaminobutyric acids, N-alkyliminodipropionic acids, N-hydroxyethyl-N-alkylamidopropylglycines, N-alkyltaurines, N-alkylsarcosines, 2-alkylaminopropionic acids and alkylaminoacetic acids having in each case about 8 to 18 carbon atoms in the alkyl group. Particularly preferred ampholytic surfactants are N-cocoalkylaminopropionate, cocoacylaminoethylaminopropionate and $C_{12/18}$-acylsarcosine. In addition to the ampholytic emulsifiers, quaternary emulsifiers are also suitable, those of the esterquat type, preferably methyl-quaternized difatty acid triethanolamine ester salts, being particularly preferred.

As superfatting agents, it is possible to use substances such as, for example, lanolin and lecithin, and polyethoxylated or acylated lanolin and lecithin derivatives, polyol fatty acid esters, monoglycerides and fatty acid alkanolamides, the latter also serving as foam stabilizers.

Examples of suitable pearlescent waxes are: alkylene glycol esters, specifically ethylene glycol disterate; fatty acid alkanolamides, specifically coconut fatty acid diethanolamide; partial glycerides, specifically stearic acid monoglyceride; esters of polybasic, optionally hydroxy-substituted carboxylic acids with fatty alcohols having 6 to 22 carbon atoms, specifically long-chain esters of tartaric acid; fatty substances, such as, for example, fatty alcohols, fatty ketones, fatty aldehydes, fatty ethers and fatty carbonates which have a total of at least 24 carbon atoms, specifically laurone and distearyl ether; fatty acids, such as stearic acid, hydroxystearic acid or behenic acid, ring-opening products of olefin epoxides having 12 to 22 carbon atoms with fatty alcohols having 12 to 22 carbon atoms and/or polyols having 2 to 15 carbon atoms and 2 to 10 hydroxyl groups, and mixtures thereof.

Suitable bodying agents are primarily fatty alcohols or hydroxy fatty alcohols having 12 to 22 and, preferably, 16 to 18 carbon atoms, and also partial glycerides, fatty acids or hydroxy fatty acids. Preference is given to a combination of these substances with alkyl oligoglucosides and/or fatty acid N-methylglucamides of identical chain length and/or polyglycerol poly-12-hydroxystearates. Suitable thickeners are, for example, polysaccharides, in particular xanthan gum, guar guar, agar agar, alginates and Tyloses, cellulose derivatives, for example carboxymethylcellulose and hydroxyethylcellulose, and also relatively high molecular weight polyethylene glycol mono- and diesters of fatty acids, polyacrylates (e.g. Carbopols™ from Goodrich or Synthalens™ from Sigma), polyacrylamides, polyvinyl alcohol and polyvinylpyrrolidone, surfactants, such as, for example, ethoxylated fatty acid glycerides, esters of fatty acids with polyols, such as, for example, pentaerythritol or trimethylolpropane, fatty alcohol ethoxylates having a narrowed homolog distribution or alkyl oligoglucosides, and electrolytes, such as sodium chloride and ammonium chloride.

Typical examples of fats are glycerides, and suitable waxes are, inter alia, beeswax, carnauba wax, candelilla wax, montan wax, paraffin wax or microcrystalline waxes, optionally in combination with hydrophilic waxes, e.g. cetylstearyl alcohol or partial glycerides. Stabilizers which may be used are metal salts of

fatty acids, such as e.g. magnesium, aluminum and/or zinc stearate or ricinoleate.

Suitable silicone compounds are, for example, dimethylpolysiloxanes, methylphenylpolysiloxanes, cyclic silicones, and amino-, fatty-acid-, alcohol-, polyether-, epoxy-, fluorine-, glycoside- and/or alkyl-modified silicone compounds, which can either be in liquid or resin form at room temperature. Typical examples of fats are glycerides, and suitable waxes are, inter alia, beeswax, carnauba wax, candelilla wax, montan wax, paraffin wax or microcrystalline waxes, optionally in combination with hydrophilic waxes, e.g. cetylstearyl alcohol or partial glycerides. Stabilizers which may be used are metal salts of fatty acids, such as e.g. magnesium stearate, aluminum stearate and/or zinc stearate.

Suitable solvents are, in particular, water and lower monoalcohols or polyols having 1 to 6 carbon atoms and mixtures thereof; preferred monoalcohols or polyols are ethanol, isopropanol, propylene glycol, glycerol and sorbitol.

To improve the flow behavior, it is also possible to use hydrotropic agents, such as, for example, ethanol, isopropyl alcohol or polyols. Polyols which are suitable here preferably have 2 to 15 carbon atoms and at least two hydroxyl groups. Typical examples are

- glycerol;
- alkylene glycols, such as, for example, ethylene glycol, diethylene glycol, propylene glycol, butylene glycol, hexylene glycol, and polyethylene glycols having an average molecular weight of from 100 to 1000 daltons;
- technical-grade oligoglycerol mixtures having a degree of self-condensation of from 1.5 to 10, such as, for example, technical-grade diglycerol mixtures with a diglycerol content of from 40 to 50% by weight;
- methylol compounds, such as, in particular, trimethylolethane, trimethylolpropane, trimethylolbutane, pentaerythritol and dipentaerythritol;
- lower alkylglucosides, in particular those having 1 to 8 carbon atoms in the alkyl radical, such as, for example, methyl- and butylglucoside;
- sugar alcohols having 5 to 12 carbon atoms, such as, for example, sorbitol or mannitol;
- sugars having 5 to 12 carbon atoms, such as, for example, glucose or sucrose;

- amino sugars, such as, for example, glucamine.

Examples of suitable preservatives are phenoxyethanol, formaldehyde solution, parabens, pentanediol or sorbic acid, and the other classes of substance listed in Appendix 6, Part A and B, of the Cosmetics Directive.

These include, for example, all suitable preservatives having a specific action against Gram-positive bacteria, e.g. triclosan (2,4,4'-trichloro-2'-hydroxydiphenyl ether), chlorhexidin (1,1'-hexamethylenebis[5-(4-chlorophenyl)biguanide) and TTC (3,4,4'-trichlorocarbanilide). Quaternary ammonium compounds are in principle likewise suitable, but are preferably used for disinfecting soaps and washing lotions. Numerous fragrances also have antimicrobial properties. Specific combinations with particular effectiveness against Gram-positive bacteria are used for the composition of deodorant perfumes. A large number of essential oils or characteristic ingredients thereof, such as, for example, oil of cloves (eugenol), mint oil (menthol) or thyme oil (thymol), also exhibit marked antimicrobial effectiveness.

The preservatives are usually used in concentrations of from about 0.1 to 0.3% by weight.

Perfume oils which may be mentioned are mixtures of natural and synthetic fragrances. Natural fragrances are extracts from flowers (lily, lavender, rose, jasmine, neroli, ylangylang), stems and leaves (geranium, patchouli, petitgrain), fruits (aniseed, coriander, cumin, juniper), fruit peels (bergamot, lemon, orange), roots (mace, angelica, celery, cardamom, costus, iris, calmus), woods (pinewood, sandalwood, guaiac wood, cedarwood, rosewood), herbs and grasses (tarragon, lemongrass, sage, thyme), needles and branches (spruce, fir, pine, dwarf-pine), resins and balsams (galbanum, elemi, benzoin, myrrh, olibanum, opoponax). Also suitable are animal raw materials, such as, for example, civet and castoreum. Typical synthetic fragrance compounds are products of the ester, ether, aldehyde, ketone, alcohol and hydrocarbon type. Fragrance compounds of the ester type are e.g. benzyl acetate, phenoxyethyl isobutyrate, p-tert-butylcyclohexyl acetate, linalyl acetate, dimethylbenzylcarbinyl acetate, phenylethyl acetate, linalyl benzoate, benzyl formate, ethyl methylphenylglycinate, allyl cyclohexylpropionate, styrallyl propionate and benzyl salicylate. The ethers include, for example, benzyl ethyl ether, the aldehydes include, for example, the linear alkanals having 8 to 18 carbon atoms, citral, citronellal, citronellyloxyacetaldehyde, cyclamenaldehyde, hydroxycitronellal, lilial and bourgeonal, and

the ketones include, for example, the ionones, α-isomethylionone and methyl cedryl ketone, and the alcohols include anethole, citronellol, eugenol, isoeugenol, geraniol, linalool, phenylethyl alcohol and terpineol, and the hydrocarbons include mainly the terpenes and balsams. Preference is, however, given to using mixtures of different fragrances which together produce a pleasing scent note. Essential oils of lower volatility, which are mostly used as flavor components, are also suitable as perfume oils, e.g. sage oil, camomile oil, oil of cloves, balm oil, mint oil, cinnamon leaf oil, lime blossom oil, juniperberry oil, vetiver oil, olibanum oil, galbanum oil, labolanum oil and lavandin oil. Preference is given to using bergamot oil, dihydromyrcenol, lilial, lyral, citronellol, phenylethyl alcohol, α-hexylcinnamaldehyde, geraniol, benzylacetone, cyclamenaldehyde, linalool, boisambrene forte, ambroxan, indole, hedione, sandelice, lemon oil, mandarin oil, orange oil, allyl amyl glycolate, cyclovertal, lavandin oil, clary sage oil, β-damascone, geranium oil bourbon, cyclohexyl salicylate, Vertofix Coeur, Iso-E-Super, Fixolide NP, Evernyl, iraldein gamma, phenylacetic acid, geranyl acetate, benzyl acetate, rose oxide, Romillat, Irotyl and Floramat alone or in mixtures.

Dyes which may be used are the substances approved and suitable for cosmetic purposes, as are listed, for example, in the publication "Kosmetische Färbemittel" [Cosmetic Colorants] from the Farbstoffkommission der Deutschen Forschungsgemeinschaft [Dyes Commission of the German Research Council], Verlag Chemie, Weinheim, 1984, pp. 81-106. These dyes are usually used in concentrations of from 0.001 to 0.1% by weight, based on the total mixture.

After the polymerization, it is also possible to incorporate other polymers into the polymer preparations according to the invention, if specific properties are to be set.

Suitable other polymers for this purpose are, for example, anionic, cationic, amphoteric and neutral polymers.

Examples of anionic polymers are homo- and copolymers of acrylic acid and acrylamide and salts thereof, sodium salts of polyhydroxycarboxylic acids, water-soluble or water-dispersible polyesters, polyurethanes and polyureas. Particularly suitable polymers are copolymers of tert-butyl acrylate, ethyl acrylate, methacrylic acid (e.g. Luvimer™ 100 P), copolymers of ethyl acrylate and methacrylic acid, (e.g. Luviflex™ Soft), copolymers of N-tert-butylacrylamide, ethyl acrylate, acrylic acid (Ultrahold Strong™) copolymers of vinyl acetate, crotonic acid

and optionally further vinyl esters (e.g. Luviset CA66™), maleic anhydride copolymers, optionally reacted with alcohols, anionic polysiloxanes, e.g. carboxyfunctional copolymers of vinylpyrrolidone, tert-butyl acrylate, methacrylic acid, copolymers of acrylic acid and methacrylic acid with hydrophobic monomers, e.g. C_4-C_{30}-alkyl esters of (meth)acrylic acid, C_4-C_{30}-alkyl vinyl esters, C_4-C_{30}-alkyl vinyl ethers and hyaluronic acid, and further polymers known under the trade names Amerhold DR-25, Ultrahold™, Luviset™ P.U.R., Acronal™, Acudyne™, Lovocryl™, Versatyl™, Amphomer™ (28-4910, LV-71), Placise™ L53, Gantrez™ ES 425, Advantage Plus™, Omnirez™ 2000, Resyn™ 28-1310, Resyn™ 28-2930, Balance™ (0/55), Acudyne™ 255, Aristoflex™A or Eastman AQ™.

Further other polymers are cationic polymers with the name polyquaternium according to INCI, e.g. copolymers of vinylpyrrolidone/N-vinylimidazolium salts (Luviquat™ FC, Luviquat™ HM, Luviquat™ MS, Luviquat™ Care), copolymers of N-vinylpyrrolidone/dimethylaminoethyl methacrylate, quaternized with diethyl sulfate (Luviquat™ PQ 11), copolymers of N-vinylcaprolactam/N-vinylpyrrolidone/N-vinylimidazolium salts (Luviquat™ Hold), cationic cellulose derivatives (polyquaternium-4 and 10), acrylamide copolymers (Polyquaternium-[lacuna]), Styleeze™ CC-10, Aquaflex™ SF-40 and chitosan derivatives.

Also suitable as further polymers are neutral polymers, such as polyvinylpyrrolidones, copolymers of N-vinylpyrrolidone and vinyl acetate and/or vinyl propionate, polysiloxanes, polyvinylcaprolactam and copolymers with N-vinylpyrrolidone, polyethyleneimine and salts thereof, polyvinylamines and salts thereof, cellulose derivatives, polyaspartic acid salts and derivatives. These include the polymers known under the following trade names: Luviskol™ (K, VA, Plus), PVP K, PVP/VA, Advantage™ HC and H_2OLD EP-1.

Also suitable are biopolymers, i.e. polymers obtained from naturally renewable raw materials and made from natural monomer units, e.g. cellulose derivatives, chitin, chitosan, DNA, hyaluronic acid and RNA derivatives.

Further polymers are also betainic polymers, such as Yukaformers (R205, SM) and Diaformers.

The list below contains the INCI/CTFA names and the manufacturers of the polymers listed above:

INCI/CTFA	Polymer	Manufacturer
Acrylates Copolymer	Amerhold DR-25	Amerchol
PVP/VA Copolymer	Luviskol VA	BASF
Polyvinylcaprolactam	Luviskol Plus	BASF
Styrene/Acrylates Copolymer	Acronal 290 D, 296 D	BASF
VA/Crotonates Copolymer	Luviset CA 66	BASF
Acrylates/Acrylamide Copolymer	Ultrahold 8	BASF
Acrylates/Acrylamide Copolymer	Ultrahold Strong	BASF
Acrylates Copolymer	Luviflex Soft	BASF
Acrylates Copolymer	Luvimer 100P, 36D, 30E	BASF
Polyquaternium 46	Luviquat Hold	BASF
Polyurethane-1	Luviset P.U.R.	BASF
Methacryloyl Ethylbetaine/Acrylates Copolymer	Diaformer	Clariant
Diglycol/CHDM/Isophthalates/ SIP Copolymer	Eastman AQ Polymer	Eastman
VA/Crotonates Copolymer	Aristoflex A	Hoechst Celanese
Acrylates/Diacetoneacrylamide Copolymer	Plascize L-53	Goo Chemical
PVP	PVP K	ISP
PVP/VA Copolymer	PVP/VA	ISP
Vinyl Caprolactam/ PVP/Dimethylaminoethyl Methacrylate Copolymer	Copolymer VC 713 (= Advantage HC)	ISP
Vinyl Caprolactam/ PVP/Dimethylaminoethyl Methacrylate Copolymer	$H_2OLD^{®}$ EP-1	ISP
PVM/MA Butylester Copolymer	Gantrez ES 425	ISP
VA/Butyl Maleate/Isobornyl Acrylate	Advantage Plus	ISP
Ethyl Ester of PVM/MA Copolymer	Omnirez 2000	ISP
PVP/DMAPA Acrylates Copolymer	Styleeze CC-10	ISP
PVP/Vinylcaprolactam/DMAPA Acrylates Copolymer	Aquaflex SF-40	ISP
	Yukaformer R205	Mitsubishi
	Yukaformer SM	Mitsubishi
VA/Crotonates/Copolymer	Resyn 28-1310	National Starch
VA/Crotonates/Neodecanoate Copolymer	Resyn 28-2930	National Starch
Octylacrylamide/Acrylates/ Butylaminoethyl Methacrylate Copolymer	Amphomer 28-4910	National Starch
Octylacrylamide/Acrylates/ Butylaminoethyl Methacrylate Copolymer	Amphomer LV-71	National Starch
Acrylates/Octylacrylamide Copolymer	Versatyl 42	National Starch
Octylacrylamide/Acrylates Copolymer	Versatyl 90	National Starch

INCI/CTFA	Polymer	Manufacturer
Acrylates Copolymer	Balance 0/55	National Starch
Octylacrylamide/Acrylates/Butyl aminoethyl Methacrylate Copolymer	Lovocryl 47	National Starch
Acrylates/Hydroxyesters Acrylates	Acudyne	Rohm & Haas

The total fraction of auxiliaries and additives can be 1 to 50% by weight, preferably 5 to 40% by weight, based on the compositions.

The auxiliaries can be present during the polymerization and/or be added after the polymerization.

If the polymers according to the invention are prepared in inverse suspension polymerization in cosmetic oils, the oil phase chosen according to the invention is a component which has a positive effect on the cosmetic formulation (appearance, feel on the skin). Such components are, for example, native oils, such as sunflower oil, almond oil, avocado oil, wax esters, such as jojoba oil, fatty acid isopropyl esters, such as isopropyl palmitate, isopropyl myristate, di- and triglycerides of fatty acids, such as, for example, caprylic /capric glycerides. The proportion of oil phase in the overall emulsion is 15 to 70% by weight, preferably 20 to 35% by weight.

In order to disperse the water phase in the organic phase, W/O emulsifiers known for this purpose are used. The HLB value of the emulsifiers used is between 4 and 8 [HLB value = hydrophilic/lipophilic balance, cf. W.C. Griffin, J. Soc. Cosmet. Chem. 1, (1950) 311]. Such emulsifiers are, for example, sorbitan monooleate, sorbitan monostearate, glyceryl monostearate, block copolymers of hydroxy fatty acids-polyesters and polyoxyethylene. They can be used alone or in combination in overall concentrations of from 2 to 10% by weight, preferably from 2 to 5% by weight, based on the overall emulsion.

It is also possible to add emulsifiers with an HLB value of more than 8 to the emulsion, specifically in concentrations of from 0.25 to 7% by weight, based on the total emulsion. Such emulsifiers are, for example, ethoxylated C_6-C_{12}-nonylphenols and C_{12}-C_{18}-fatty alcohols, the degree of ethoxylation is 5 to 20 mol%.

The emulsification of the aqueous phase into the oil phase does not require any special units; the aqueous monomer phase can be emulsified in a standard polymerization vessel by stirring, e.g. with an anchor stirrer. The rate of rotation is between 30 and 400 rpm, depending on the geometry of the tank.

Following the polymerization, water-in-oil emulsions are obtained which have a solids content of from 10 to 40% by weight, preferably from 15 to 35% by weight. To increase the solids content, some or all of the water can be removed from the emulsions by distillation.

The W/O emulsions of the polymers according to the invention are used as thickeners, preferably in skin cosmetic or pharmaceutical preparations. The polymers can be used directly in the form of the W/O emulsion. The thickening action of the W/O emulsion starts immediately after the W/O emulsion has been mixed with a cosmetic and/or pharmaceutical O/W emulsion; it is not necessary to add an inversion agent to achieve the optimum effect. It is also possible to thicken purely aqueous systems. This gives a creme gel.

The preparations according to claims 10 and/or 11 are suitable in particular for use in cosmetic compositions. Thus, they can, for example, be used in cosmetic compositions for cleansing the skin. Such cosmetic cleansers are chosen from soap bars, such as toilet soaps, curd soaps, transparent soaps, luxury soaps, deodorant soaps, creme soaps, baby soaps, skin-protection soaps, abrasive soaps and syndets, liquid soaps, such as paste soaps, soft soaps and washing pastes, and liquid wash, shower and bath preparations, such as washing lotions, shower preparations and gels, foam baths, oil baths and scrub preparations, and shaving foams, lotions and cremes.

The preparations according to the invention can also be used in cosmetic preparations for the care of the skin. The skin care compositions are, in particular, in the form of W/O or O/W skin cremes, day and night cremes, eye cremes, face cremes, antiwrinkle cremes, moisturizing cremes, bleaching cremes, vitamin cremes, skin lotions, care lotions and moisturizing lotions.

Furthermore, they are suitable for skin cosmetic preparations such as face tonics, face masks, deodorants and other cosmetic lotions.

Furthermore, the preparations according to the invention can be used as strips for pore cleansing or skin foaming, in antiacne products, repellents, shaving products, depilatories, personal hygiene productions, foot care products, and in baby care.

The novel preparations according to claims 10 and/or 11 are suitable in particular for hair cosmetics, preferably in preparations such as hair cures, hair lotions, hair rinses, hair emulsions, hair-end fluids, neutralizing agents for permanent waves, hot-oil treatment preparations, conditioners, curl relaxers, styling wrap lotions, setting lotions, shampoos, hair colorants or hair sprays.

When formulating hair-setting compositions, it must be taken into consideration that, owing to the environmental regulations regarding control of the emission of volatile organic compounds (VOCs) into the atmosphere, it is necessary to reduce the content of alcohol and propellant.

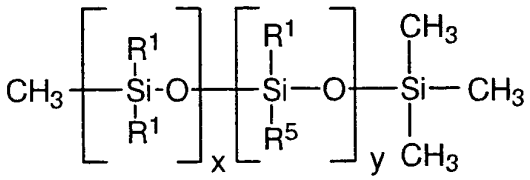
The preparations according to the invention are preferably used as film formers and/or coating agents in cosmetic and/or pharmaceutical preparations, in particular for keratin-containing and keratin-analogous surfaces, such as hair, skin and nails.

In a particularly preferred embodiment, the preparations according to claims 10 and/or 11 are used in cosmetic preparations for nail care.

Very particular preference is given to the use of the preparations according to claims 10 and/or 11 in decorative cosmetics preparations.

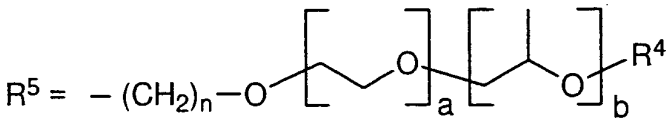
The invention further provides for the use of an polymer which is obtainable by free-radical polymerization of a monomer mixture of

(a1) 49.5 to 90% by weight of (meth)acrylate, in particular tert-butyl acrylate,
(a2) 0.5 to 40% by weight of a further (meth)acrylate, in particular methacrylic acid,
(b) 0.5 to 20% by weight of a polyalkylene-oxide-containing silicone derivative according to the following formula



where

R^1 = $-CH_3$



R^4 = -H; $-COCH_3$, alkyl with C_1-C_4

n = 1 to 6, in particular 2 to 4, preferably 3

x and y are integers such that the molecular weight of the polysiloxane block is between 1000 and 5000,

a, b may be integers between 0 and 50, with the proviso that the sum of a and b is greater than 0,

in decorative cosmetics preparations.

Decorative cosmetics preparations which may be mentioned are, for example, concealing pencils, stage makeup, mascara and eye shadows, lipsticks, kohl pencils, eyeliners, makeup, foundations, blushers and powders and eyebrow pencils, and, in particular, nail varnishes.

The polymers are usually present in the cosmetic and/or pharmaceutical preparations in an amount in the range from about 0.001 to 20% by weight, preferably 0.1 to 10% by weight, based on the total weight of the preparations.

Examples 1 to 6: Preparation of the polymers

50 g of feed 1 and 3.75 g of feed 2 are added dropwise to a stirred initial charge. The mixture is then heated to 78°C. Then, over the course of 1.5 h, the remainder of feed 1 and of feed 2 are added dropwise. The mixture is stirred for a further 2 h. Feed 3 is then added dropwise over the course of 15 minutes, and the mixture is stirred for a further 3 h at 78°C.

Example 1

Initial charge: 175 g of ethanol, 7.5 g of Dow Corning 190™
Feed 1: 251 g of t-butyl acrylate, 86 g of methacrylic acid, 37 g of ethyl acrylate, 75 g of ethanol
Feed 2: 2 g of t-butyl perpivalate, 100 g of ethanol
Feed 3: 1.5 g of t-butyl perpivalate, 57 g of ethanol

Example 2

Initial charge: 175 g of ethanol, 18.75 g of Dow Corning 190™
Feed 1: 251 g of t-butyl acrylate, 86 g of methacrylic acid, 37 g of ethyl acrylate, 75 g of ethanol
Feed 2: 2 g of t-butyl perpivalate, 100 g of ethanol
Feed 3: 1.5 g of t-butyl perpivalate, 57 g of ethanol

Example 3

Initial charge: 175 g of ethanol, 37.5 g of Dow Corning 190™
Feed 1: 251 g of t-butyl acrylate, 86 g of methacrylic acid, 37 g of ethyl acrylate, 75 g of ethanol
Feed 2: 2 g of t-butyl perpivalate, 100 g of ethanol
Feed 3: 1.5 g of t-butyl perpivalate, 57 g of ethanol

Example 4

Initial charge: 175 g of ethanol, 18.75 g of Belsil DMC 6031™
Feed 1: 251 g of t-butyl acrylate, 86 g methacrylic acid, 37 g of ethyl acrylate, 75 g of ethanol
Feed 2: 2 g of t-butyl perpivalate, 100 g of ethanol
Feed 3: 1.5 g of t-butyl perpivalate, 57 g of ethanol

Example 5

Initial charge: 175 g of ethanol, 37.5 g of Belsil DMC 6031™
Feed 1: 279 g of t-butyl acrylate, 96 g of methacrylic acid, 75 g of ethanol
Feed 2: 2 g of butyl perpivalate, 100 g of ethanol
Feed 3: 1.5 g of t-butyl perpivalate, 57 g of ethanol

Example 6

Initial charge: 175 g of ethanol, 37.5 g of Belsil DMC 6031™
Feed 1: 300 g of t-butyl acrylate, 75 g of methacrylic acid, 75 g of ethanol
Feed 2: 2 g of t-butyl perpivalate, 100 g of ethanol
Feed 3: 1.5 g of t-butyl perpivalate, 57 g of ethanol

Example 7
Gel formulation

Phase A and phase B are each prepared and phase B is incorporated into phase A.

Phase A	0.50% by weight	Carbopol 980™ (Goodrich)
	49.5% by weight	water, demineralized
	0.40% by weight	triethanolamine
Phase B	1.00% by weight	polymer as in Example 1 or Ex. 5
	0.12% by weight	2-amino-2-methylpropanol
	2.00% by weight	Uvinul MS 40
	20.00% by weight	ethanol
	26.48% by weight	water, demineralized

Example 8
Hair cocktail

Phase A	3.00% by weight	Luvigel EM™ (BASF)
	2.00% by weight	Belsil DM 1000™ (Wacker)
	2.00% by weight	Belsil CM 1000™ (Wacker)
	1.50% by weight	Belsil PDM 200™ (Wacker)
	1.50% by weight	Belsil ADM 6057 E™ (Wacker)
	2.00% by weight	Univul MS 40
	0.50% by weight	Belsil DMC 6031™ (Wacker)
	1.00% by weight	Macadamia nut oil (Ex. Huile de Macadamio from Wacker)
	0.50% by weight	Vitamin-E-Acetat™ (BASF)
	1.00% by weight	Cremophor RH 40™ (BASF)
	0.40% by weight	Perfume oil
Phase B	4.00% by weight	Addition polymer as in Example 1 or Ex. 5
	0.46% by weight	2-Amino-2-methylpropanol
	0.10% by weight	Euxyl K 100™ (Schulke & Mayr)
ad 100.00	water, demineralized	

Example 9

As example 8 but with 0.40% Pemulen TR 1™ (Goodrich) instead of 3.00% Luvigel EM™ (BASF)
ad 100.00 Water, demineralized

Example 10
As example 8 but with 3.5% Luvigel EM™ instead of 3.00% Luvigel EM™ (BASF)
ad 100,00 Water, demineralized

Examples 11 to 20
Hairsprays

Polymers	Mixing ratio 8:2	Mixing ratio 1:1	Mixing ratio 2:8
Luviflex Silk / Luviskol VA37	6.40% Luviflex Silk™ 1.60% Luviskol VA37E™ 0.74% AMP (2–Amino–2–methylpropanol) 51.26% Ethanol 40.00% DME (Dimethyl ether)	4.0% Luviflex Silk™ 4.0% Luviskol VA37E™ 0.46% AMP 51.54% Ethanol 40.0% DME	1.6% Luviflex Silk™ 6.4% Luviskol VA37E™ 0.19% AMP 51.81% Ethanol 40.0% DME
Luviflex Silk / Luviskol K30	6.4% Luviflex Silk™ 0.8% Luviskol K30™ 0.74% AMP 52.06% Ethanol 40.0% DME	4.0% Luviflex Silk™ 2.0% Luviskol K30™ 0.46% AMP 53.54% Ethanol 40.0% DME	1.6% Luviflex Silk™ 3.2% Luviskol K30™ 0.19% AMP 55.01% Ethanol 40.0% DME
Luviflex Silk / Luviskol Plus	6.4% Luviflex Silk™ 2.0% Luviskol Plus™ 0.74% AMP 50.86% Ethanol 40.0% DME	4.0% Luviflex Silk™ 5.0% Luviskol Plus™ 0.46% AMP 50.54% Ethanol 40.0% DME	1.6% Luviflex Silk™ 8.0% Luviskol Plus™ 0.19% AMP 50.21% Ethanol 40.0% DME
Luviflex Silk / Luviset P.U.R.	6.4% Luviflex Silk™ 2.67% Luviset P.U.R™ 0.73% AMP 50.20% Ethanol 40.0% DME	4.0% Luviflex Silk™ 6.67% Luviset P.U.R™ 0.46% AMP 48.87% Ethanol 40.0% DME	1.6% Luviflex Silk™ 10.67% Luviset P.U.R™ 0.19% AMP 47.54% Ethanol 40.0% DME

Polymers	Mixing ratio 8:2	Mixing ratio 1:1	Mixing ratio 2:8
Luviflex Silk / Ultrahold 8	6.4% Luviflex Silk™ 0.8% Ultrahold 8 ™ 0.82% AMP 51.98% Ethanol 40.0% DME	4.0% Luviflex Silk™ 2.0% Ultrahold 8 ™ 0.66% AMP 53.34% Ethanol 40.0% DME	1.6% Luviflex Silk™ 3.2% Ultrahold 8 ™ 0.51% AMP 54.69% Ethanol 40.0% DME
Luviflex Silk / Ultrahold Strong	6.4% Luviflex Silk™ 0.8% Ultrahold Strong ™ 0.84% AMP 51.96% Ethanol 40.0% DME	4.0% Luviflex Silk™ 2.0% Ultrahold Strong ™ 0.71% AMP 53.29% Ethanol 40.0% DME	1.6% Luviflex Silk™ 3.2% Ultrahold Strong ™ 0.59% AMP 54.61% Ethanol 40.0% DME
Luviflex Silk / Luviset CA66	6.4% Luviflex Silk™ 0.8% Luviset CA66 ™ 0.82% AMP 51.98% Ethanol 40.0% DME	4.0% Luviflex Silk™ 2.0% Luviset CA66 ™ 0.69% AMP 53.31% Ethanol 40.0% DME	1.6% Luviflex Silk™ 3.2% Luviset CA66 ™ 0.53% AMP 54.67% Ethanol 40.0% DME
Luviflex Silk / Luviset CAN	6.4% Luviflex Silk™ 0.8% Luviset CAN ™ 0.82% AMP 51.98% Ethanol 40.0% DME	4.0% Luviflex Silk™ 2.0% Luviset CAN ™ 0.70% AMP 53.3% Ethanol 40.0% DME	1.6% Luviflex Silk™ 3.2% Luviset CAN ™ 0.54% AMP 54.66% Ethanol 40.0% DME
Luviflex Silk / Amphomer	6.4% Luviflex Silk™ 0.8% Amphomer ™ 0.88% AMP 51.92% Ethanol 40.0% DME	4.0% Luviflex Silk™ 2.0% Amphomer ™ 0.83% AMP 52.87% Ethanol 40.0% DME	1.6% Luviflex Silk™ 3.2% Amphomer ™ 0.77% AMP 54.43% Ethanol 40.0% DME

Examples 21 to 30

Hairsprays containing propane/butane 3.5 bar or propane/butane 3.5 bar with addition of DME

Polymers	Mixing ratio 8:2	Mixing ratio 1:1	Mixing ratio 2:8
Luviflex Silk / Luviskol VA37	6.4% Luviflex Silk™ 1.6% Luviskol VA37E™ 0.74% AMP 51.26% Ethanol 10.0% Pr/Bu 3.5 (Propane/Butane 3.5 bar) 30.0% DME	4.0% Luviflex Silk™ 4.0% Luviskol VA37E™ 0.46% AMP 51.54% Ethanol 10.0% Pr/Bu 3.5 30.0% DME	1.6% Luviflex Silk™ 6.4% Luviskol VA37E™ 0.19% AMP 51.81% Ethanol 10.0% Pr/Bu 3.5 30.0% DME
Luviflex Silk / Luviskol K30	6.4% Luviflex Silk™ 0.8% Luviskol K30™ 0.74% AMP 52.06% Ethanol 40.0% Pr/Bu 3.5	4.0% Luviflex Silk™ 2.0% Luviskol K30™ 0.46% AMP 53.54% Ethanol 40.0% Pr/Bu 3.5	1.6% Luviflex Silk™ 3.2% Luviskol K30™ 0.19% AMP 55.01% Ethanol 40.0% Pr/Bu 3.5
Luviflex Silk / Luviskol Plus	6.4% Luviflex Silk™ 2.0% Luviskol Plus™ 0.74% AMP 50.86% Ethanol 40.0% Pr/Bu 3.5	4.0% Luviflex Silk™ 5.0% Luviskol Plus™ 0.46% AMP 50.54% Ethanol 40.0% Pr/Bu 3.5	1.6% Luviflex Silk™ 8.0% Luviskol Plus™ 0.19% AMP 50.21% Ethanol 40.0% Pr/Bu 3.5
Luviflex Silk / Luviset P.U.R.	Not possible	4.0% Luviflex Silk™ 6.67% Luviset P.U.R™ 0.46% AMP 48.87% Ethanol 10% Pr/Bu 3.5 30.0% DME	1.6% Luviflex Silk™ 10.67% Luviset P.U.R™ 0.19 % AMP 47.54% Ethanol 15% Pr/Bu 3.5 25.0% DME
Luviflex Silk / Luvimer 100P	6.4% Luviflex Silk™ 0.8% Luvimer 100P™ 0.93% AMP 51.87% Ethanol 40.0% Pr/Bu 3.5	4.0% Luviflex Silk™ 2.0% Luvimer 100P™ 0.94% AMP 53.06% Ethanol 40.0% Pr/Bu 3.5	1.6 % Luviflex Silk™ 3.2 % Luvimer 100P™ 0.95 % AMP 54.25 % Ethanol 40.0 % Pr/Bu 3.5
Luviflex Silk / Ultrahold 8	6.4% Luviflex Silk™ 0.8% Ultrahold 8™ 0.82% AMP 51.98% Ethanol 40.0% Pr/Bu 3.5	4.0% Luviflex Silk™ 2.0% Ultrahold 8™ 0.66% AMP 53.34% Ethanol 40.0% Pr/Bu 3.5	1.6% Luviflex Silk™ 3.2% Ultrahold 8™ 0.51% AMP 54.69% Ethanol 40.0% Pr/Bu 3.5

Polymers	Mixing ratio 8:2	Mixing ratio 1:1	Mixing ratio 2:8
Luviflex Silk / Ultrahold Strong	6.4% Luviflex Silk™ 0.8% Ultrahold Strong™ 0.84% AMP 51.96% Ethanol 40.0% Pr/Bu 3.5	4.0% Luviflex Silk™ 2.0% Ultrahold Strong™ 0.71% AMP 53.29% Ethanol 40.0% Pr/Bu 3.5	1.6% Luviflex Silk™ 3.2% Ultrahold Strong™ 0.59% AMP 54.61% Ethanol 40.0% Pr/Bu 3.5
Luviflex Silk / Luviset CA66	6.4% Luviflex Silk™ 0.8% Luviset CA66™ 0.82% AMP 51.98% Ethanol 10.0% Pr/Bu 3.5 30.0% DME	4.0% Luviflex Silk™ 2.0% Luviset CA66™ 0.69% AMP 53.31% Ethanol 10.0% Pr/Bu 3.5 30.0% DME	1.6% Luviflex Silk™ 3.2% Luviset CA66™ 0.53% AMP 54.67% Ethanol 10.0% Pr/Bu 3.5 30.0% DME
Luviflex Silk / Luviset CAN	6.4% Luviflex Silk™ 0.8% Luviset CAN™ 0.82% AMP 51.98% Ethanol 20.0% Pr/Bu 3.5 20.0% DME	4.0% Luviflex Silk™ 2.0% Luviset CAN™ 0.70% AMP 53.3% Ethanol 20.0% Pr/Bu 3.5 20.0% DME	1.6% Luviflex Silk™ 3.2% Luviset CAN™ 0.54% AMP 54.66% Ethanol 20.0% Pr/Bu 3.5 20.0% DME
Luviflex Silk / Amphomer	6.4% Luviflex Silk™ 0.8% Amphomer™ 0.88% AMP 51.92% Ethanol 40.0% Pr/Bu 3.5	4.0% Luviflex Silk™ 2.0% Amphomer™ 0.83% AMP 52.87% Ethanol 40.0% Pr/Bu 3.5	1.6% Luviflex Silk™ 3.2% Amphomer™ 0.77% AMP 54.43% Ethanol 40.0% Pr/Bu 3.5

Examples 31 to 40
Pump sprays

Polymers	Mixing ratio 8:2	Mixing ratio 1:1	Mixing ratio 2:8
Luviflex Silk / Luviskol VA37	10.85% Luviflex Silk™ 2.66% Luviskol VA37E™ 1.27% AMP 85.22% Ethanol	6.74% Luviflex Silk™ 6.66% Luviskol VA37E™ 0.79% AMP 85.81% Ethanol	2.69% Luviflex Silk™ 10.64% Luviskol™ VA37E 0.32% AMP 86.35% Ethanol
Luviflex Silk / Luviskol K30	10.85% Luviflex Silk™ 1.33% Luviskol K30™ 1.27% AMP 86.55% Ethanol	6.74% Luviflex Silk™ 3.33% Luviskol K30™ 0.79% AMP 84.14% Ethanol	2.69% Luviflex Silk™ 5.32% Luviskol K30™ 0.32% AMP 83.69% Ethanol

Polymers	Mixing ratio 8:2	Mixing ratio 1:1	Mixing ratio 2:8
Luviflex Silk / Luviskol Plus	10.85% Luviflex Silk™ 3.33% Luviskol Plus™ 1.27% AMP 84.55% Ethanol	6.74% Luviflex Silk™ 8.33% Luviskol Plus™ 0.79% AMP 89.14% Ethanol	2.69% Luviflex Silk™ 13.3% Luviskol Plus™ 0.32% AMP 90.21% Ethanol
Luviflex Silk / Luviset P.U.R.	10.85% Luviflex Silk™ 4.43% Luviset P.U.R™ 1.27% AMP 83.45% Ethanol	6.74% Luviflex Silk™ 11.1% Luviset P.U.R™ 0.79% AMP 81.37% Ethanol	2.69% Luviflex Silk™ 17.73% Luviset P.U.R™ 0.32% AMP 79.26% Ethanol
Luviflex Silk / Luvimer 100P	10.85% Luviflex Silk™ 1.33% Luvimer 100P™ 1.55% AMP 86.27% Ethanol	6.74% Luviflex Silk™ 3.33% Luvimer 100P™ 1.56% AMP 88.37% Ethanol	2.69% Luviflex Silk™ 5.32% Luvimer 100P™ 1.58% AMP 90.41% Ethanol
Luviflex Silk / Ultrahold 8	10.85% Luviflex Silk™ 1.33% Ultrahold 8™ 1.36% AMP 86.46% Ethanol	6.74% Luviflex Silk™ 3.33% Ultrahold 8™ 1.1 % AMP 88.83% Ethanol	2.69% Luviflex Silk™ 5.32% Ultrahold 8™ 0.85% AMP 91.14% Ethanol
Luviflex Silk / Ultrahold Strong	10.85% Luviflex Silk™ 1.33% Ultrahold Strong™ 1.4% AMP 86.42% Ethanol	6.74% Luviflex Silk™ 3.33% Ultrahold Strong™ 1.18% AMP 88.75% Ethanol	2.69% Luviflex Silk™ 5.32% Ultrahold Strong™ 0.98% AMP 91.01% Ethanol
Luviflex Silk / Luviset CA66	10.85% Luviflex Silk™ 1.33% Luviset CA66™ 1.36% AMP 86.46% Ethanol	6.74% Luviflex Silk™ 3.33% Luviset CA66™ 1.15% AMP 88.78% Ethanol	2.69% Luviflex Silk™ 5.32% Luviset CA66™ 0.88% AMP 91.11% Ethanol
Luviflex Silk / Luviset CAN	10.85% Luviflex Silk™ 1.33% Luviset CAN™ 1.37% AMP 86.45% Ethanol	6.74% Luviflex Silk™ 3.33% Luviset CAN™ 1.17% AMP 88.76% Ethanol	2.69% Luviflex Silk™ 5.32% Luviset CAN™ 0.9% AMP 91.09% Ethanol
Luviflex Silk / Amphomer	10.85% Luviflex Silk™ 1.33% Amphomer™ 1.47% AMP 86.35% Ethanol	6.74% Luviflex Silk™ 3.33% Amphomer™ 1.38% AMP 88.55% Ethanol	2.69% Luviflex Silk™ 3.33% Amphomer™ 1.28% AMP 92.7% Ethanol

Example 41

Hairspray formulation based on dimethyl ether

1.00% by wt. Luviskol K30™ (BASF)
2.92% by wt. Luviflex Silk™ (BASF)
0.92% by wt. 2-Amino-2-methylpropanol

0.10% by wt.	Diisobutyl adipate (Ex. Crodanol DiBA from Croda Oleochemicals)
0.05% by wt.	Isodecane
0.10% by wt.	Perfume oil
0.05% by wt.	D-Panthenol USP™ (BASF)
14.78% by wt.	Water, demineralized
36.08% by wt.	Ethanol
40.00% by wt.	Dimethyl ether

Example 42

Hairspray formulations based on isobutane and n-pentane

A)	6.80%	Luviflex Silk™ (BASF)
	0.79%	2-Amino-2-methylpropanol
	14.20%	n-Pentane
	2.40%	n-Butane
	35.90%	Isobutane
	39.91%	Ethanol

B)	3.00%	Ultrahold Strong™ (BASF)
	1.00%	Luviflex Silk™ (BASF)
	0.48%	2-Amino-2-methylpropanol
	0.03%	DOW Corning 190™ (Dow Corning)
	14.20%	n-Pentane
	2.40%	n-Butane
	35.90%	Isobutane
	42.99%	Ethanol

Example 43

Shine spray

2.00%	Luviset CA66™ (BASF)
2.00%	Luviflex Silk™ (BASF)
0.46%	2-Amino-2-methylpropanol
1.00%	DOW Corning 556 (Dow Corning)
0.10%	Niacinamide
0.20%	D-Panthenol USP™ (BASF)
14.20%	n-Pentane
35.90%	n-Butane
44.14%	Ethanol

Example 44

Hairspay VOC 80 containing HFC 152A

2.00%	Luviset CA66™ (BASF)
4.80%	Luviflex Silk™ (BASF)
0.79%	2-Amino-2-methylpropanol

56.60% Ethanol
15.81% Propellant 152a (Ex. Dymel 152a from DuPont)
20.00% Dimethyl ether

Example 45
Hairspray VOC 55 containing vitamins

4.80% Luviflex Silk™ (BASF)
3.33% Luviset P.U.R.™
0.57% 2-Amino-2-methylpropanol
0.10% Niacinamide (Hoffmann-La Roche)
0.10% Panthenol USP™ (BASF)
38.83% Water, demineralized
12.27% Ethanol
40.00% Dimethyl ether

Example 46
Sunscreen pump spray for hair

2.00% Luviflex Silk™ (BASF)
0.23% 2-Amino-2-methylpropanol
2.00% Uvinul MS 40™ (BASF) (Benzophenone-4)
95.77% Ethanol

Example 47
Hair repair

1.00% Luviskol K30™ (BASF)
4.00% Luviflex Silk™ (BASF)
0.48% 2-Amino-2-methylpropanol
0.20% Hydrolyzed wheat protein (Ex. Cropesol W™ from Croda, Inc.)
0.50% D-Panthenol USP™ (BASF)
5.00% 1,2-Propylene glycol USP™ (BASF)
10.00% Ethanol
78.82% Water, demineralized

Example 48
Shining gel for hair with UV protection

Phase A	0.80%	Carbopol 2001 ETD™ (Goodrich)
	33.84%	Water, demineralized
Phase B	5.00%	Abil 200 (Goldschmidt)
	3.00%	Karion FP (Merck KGaA)
	3.00%	1,2-Propylene glycol USP™ (BASF)
	1.00%	Cremophor RH40™ (BASF)

	q.s.	Preservative
Phase C	50.00%	Water, demineralized
	0.50%	Uvinul P25™ (BASF) (PEG-25PABA)
	2.00%	Luviflex Silk™ (BASF)
	0.23%	2-Amino-2-methylpropanol
Phase D	0.63%	2-Amino-2-methylpropanol

Example 49
Mascara

Phase A	1.50%	Cremophor A6™ (BASF)
	1.50%	Cremophor A25™ (BASF)
	2.00%	Stearic acid (Ex. Emersol 120™ from Henkel)
	3.00%	Imwitor 960 K™ (Hüls AG)
	3.00%	Softisan 100™ (Hüls AG)
	1.50%	Luvigel EM™ (BASF)
	10.00%	Dow Corning 345™ (Dow Corning)
Phase B	4.00%	Luviflex Silk™ (BASF)
	0.46%	2-Amino-2-methylpropanol
	0.30%	Germal 115™ (Sutton)
	72.24%	Water, demineralized
Phase C	0.50%	Phenoxyethanol (Ex. Phenoxetol™ from Nipa-Hardwicke)

Example 50
Shampoo formulation

1.50%	Luviflex Silk™ (BASF)
0.17%	2-Amino-methylpropanol
0.50%	Luviskol K30™ (BASF)
10.00%	Tego-Betaine L7
40.00%	Texapone NSO
0.10%	Euxyl K100
2.00%	NaCl
45.73%	Water

Example 51
Shampoo formulation containing Luviquat Care™

1.80%	Luviflex Silk™ (BASF)
0.21%	2-Amino-methylpropanol
0.20%	Luviskol K30™ (BASF)

7.70%	Luviquat Care™ (BASF)
10.00%	Tego-Betaine L7
40.00%	Texapone NSO
0.10%	Euxyl K 100
2.00%	NaCl
37.99%	Water

Example 51
Clear varnish

15.0%	Nitrocellulose
7.0%	Luviflex Silk™ (BASF)
2.4%	Camphor
4.5%	Palatinol A
7.0%	Isopropanol
8.0%	Methyl acetate
8.0%	Ethyl acetate
14.0%	Isopropyl acetate
34.1%	Butyl acetate

Example 52
Clear varnish without nitrocellulose

23.0%	Luviflex Silk™ (BASF)
7.0%	Ketjenflex MH
2.4%	Camphor
4.5%	Palatinol A
8.0%	Methyl acetate
8.0%	Ethyl acetate
14.0%	Isopropyl acetate
33.1%	Butyl acetate

Example 53
VOC 55 hairspray

21.50%	Water
35.00%	Alcohol SD 40-B
0.95%	Aminomethylpropanol
8.00%	Luviflex™ Silk
0.20%	D,L-Panthenol
0.10%	Uvinul™ MC 80 (Octyl Methoxycinnamate)
0.10%	Masil™ SF 19 (Dimethicone Copolyol)
15.00%	Dimethyl ether
20.00%	Hydrofluorocarbon 152a

Example 54
VOC 55 hairspray

34.10%	Water
52.00%	Alcohol SD 40-B
0.50%	Aminomethylpropanol
9.00%	Luviset™ P.U.R. (Polyurethane-1)
4.00%	Luviflex™ Silk
2.00%	D,L-Panthenol
0.10%	Uvinul™ MC 80 (Octyl Methoxycinnamate)
0,10%	Masil™ SF 19 (Dimethicone Copolyol)

Unless expressly mentioned otherwise, all percentages in the examples are % by weight.

Example 55
Use as film former in a disinfectant spray

150 g of an polymer (example 5) were dissolved in 375 [lacuna] of demineralized water, and 375 g of ethanol were added. 100 g of polyvinylpyrrolidone-iodine (PVP-iodine 30/06, BASF Aktiengesellschaft) were then dissolved in this polymer solution with stirring, and the preparation was transferred to pump spray bottles. The disinfectant spray exhibited very good film properties on the skin and did not show any iodine loss following storage under stress conditions (7 days at 52°C).

Performance properties

To measure the flexural rigidity, 3.0% strength by weight solutions of the further polymers, of the polymer and of the preparations according to the invention (polymer + further polymer) are prepared.

The flexural rigidity is measured on 5 to 10 strands of hair (à about 3 g and 24 cm in length) at 20°C and 65% relative humidity.

The weighed, dry strands of hair are immersed into the 3% strength polymer solution, uniform distribution being ensured by immersing and removing three times.

The excess film former solution is squeezed off between thumb and index finger, and the strands of hair are then carefully squeezed by squeezing between filter papers. The strands are then shaped by hand such that they have a round cross section. They are dried

at 20°C and a relative humidity of 65% overnight in a climatically controlled room.

The tests were carried out in climatically controlled room at 20°C and a relative humidity of 65% using a tensile/compression testing device.

The strand of hair is placed symmetrically on two cylindrical rolls for sample insertions. Then, using a rounded punch, the strand is bent from above exactly in the center (breakage of the polymer film). The force required therefor is measured using a weighing cell (50 N) and given in newtons.

Table 1 shows the values of the flexural strength of the individual polymers, and the flexural rigidity of the preparations according to the invention in ethanolic solution, which comprise the addition polymer and the further polymer in varying weight ratios (2:8; 1:1; 8:2). The polymer used was Luviflex Silk™ (BASF), which had a flexural rigidity of 109 cN.

Table 1: Flexural rigidity in cN (3% by weight of w.s. in ethanol abs.; 20°C and 65% relative humidity)

	Polymer alone	Ratio of Luviflex Silk™ to polymer		
		2:8	1:1	8:2
Luviskol VA 37 E	80 cN	90	95	106
Luviset CAN	125 cN	129	133	108
Ultrahold 8	80 cN	90	97	110
Luviskol Plus	105 cN	120	117	116

Table 2 shows the values of the flexural strength of the individual polymers, and the flexural rigidity of the preparations according to the invention in VOC 80 formulations, which comprise the polymer and the further polymer in varying weight ratios (2:8; 1:1; 8:2). The polymer was Luviflex Silk™ (BASF), which has a flexural rigidity in VOC 80 formulation of 120 cN.

Table 2: Flexural rigidity in cN (3% by weight of w.s. in VOC 80; 20°C and 65% relative humidity)

	Polymer alone	Ratio of Luviflex Silk™ to polymer		
		2:8	1:1	8:2
Luviskol VA 37 E	109 cN	137	132	114
Luviset CA 66	112 cN	159	123	117

Ultrahold Strong	180 cN	166	169	140
Luviskol Plus	129 cN	172	150	126
Luviset P.U.R.	168 cN	188	166	140
Amphomer	166 cN	172	152	175

As is clear from tables 1 and 2, the flexural rigidity of the preparations according to the invention is significantly greater than the sum of the flexural rigidities of the individual polymers both in ethanolic solution and also in VOC 80 formulations.

To measure the curl retention, 1.8% strength by weight solutions of the polymers, of the addition polymer and of the preparations according to the invention (polymer + further polymer) were prepared. The comparative sample used in each case was the individual further polymers or the polymer. The preparations according to the invention were prepared in the weight ratio 8:2, 1:1 and 2:8.
The curl retention was measured as follows:

The washed, dry strands of hair were placed for 15 minutes at about 40°C in 50% strength ethanol (ethanol abs./water dist. 1:1).

The excess liquid was squeezed out using the thumb and index finger, and the strand of hair was wound around a Plexiglas tube. The strands of hair were then dried overnight at 65 to 70°C.

After 15 minutes at room temperature, the hair was unwound. About 5 g of hair spray (from a distance of about 20 cm) were sprayed on while rotating the lock. It was then laid down to dry for 1 hour at room temperature.

The lock was suspended on one end and the lock length (LO) was measured. The lock was placed in a climatically controlled cabinet (25°C, 90% relative humidity), and its length (Lt) was measured after 15, 30, 60 and 90 minutes, and after 2, 3, 4, 5 and 24 hours. The test was carried out on at least 5 strands of hair.

$$\text{Curl retention in \%} = \frac{L-Lt}{L-LO} * 100$$

L = Length of the hair (15.5 cm)
LO = Length of the hair after drying

Lt = Length of the hair after treatment under climatically controlled conditions

Table 3 shows the values for the curl retention of the individual polymers and the curl retention of the preparations according to the invention in ethanol, which comprise the polymer and the further polymer in varying weight ratios (2:8; 1:1; 8:2). The polymer used was Luviflex Silk™ (BASF) , which has a curl retention of 93%.

Table 3: Curl retention in % (1.8% by weight of w.s. in ethanol abs., 25°C and 90% relative humidity)

	Polymer alone	Ratio of Luviflex Silk™ to polymer		
		2:8	1:1	8:2
Luviskol VA 37 E	20%	34	74	82
Luviskol K 30	<20%	25	70	84
Luviset CAN	60%	77	88	84
Luviset CA 66	20%	65	75	70

Table 4 gives the values for the curl retention of the individual polymers and the curl retention of the preparations according to the invention in VOC 80 formulations which comprise the addition polymer and the further polymer in varying weight ratios (2:8; 1:1; 8:2). The addition polymer used was Luviflex Silk™ (BASF), which has a curl retention in VOC 80 formulation of 87%.

Table 4: Curl retention in % (1.8% by weight of w.s. in VOC 80, 25°C and 90% relative humidity)

	Polymer alone	Ratio of Luviflex Silk® to polymer		
		2:8	1:1	8:2
Luviskol VA 37 E	23%	23	75	77
Luviset CA 66	34%	79	67	79